Federal programs and activities apply to this program.

Paperwork Reduction Act

This action does not contain a collection of information requirement for purposes of the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 *et seq.*

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, eliminate ambiguity, and reduce burden.

Executive Order 13045 (Protection of Children)

We have analyzed this action under Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. This rule is not an economically significant rule and does not concern an environmental risk to health or safety that may disproportionately affect children.

Executive Order 12630 (Taking of Private Property)

This rule will not effect 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 action for the purpose of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and has determined that this action would 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.

(23 U.S.C. 109(d), 114(a), 315, and 402(a); 23 CFR 1.32; 49 CFR 1.48)

Issued on: December 17, 1999.

Kenneth R. Wykle,

Administrator.

[FR Doc. 99–33404 Filed 12–29–99; 8:45 am]

BILLING CODE 4910–22–P

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

23 CFR Part 655

[FHWA Docket No. FHWA–99–6575]

RIN 2125–AE71

Revision of the Manual on Uniform Traffic Control Devices; General Provisions, Markings, and Signals

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Notice of proposed amendments to the Manual on Uniform Traffic Control Devices (MUTCD); request for comments.

SUMMARY: The MUTCD is incorporated by reference in 23 CFR part 655, subpart F, approved by the Federal Highway Administrator, and recognized as the national standard for traffic control on all public roads. The FHWA announced its intent to rewrite and reformat the MUTCD on January 10, 1992, at 57 FR 1134. The purpose of this rewrite effort is to reformat the text for clarity of intended meanings, to include metric dimensions and values for the design and installation of traffic control devices, and to improve the overall organization and discussion of the contents in the MUTCD.

This document proposes new text for the MUTCD in Part 1—General Provisions, Part 3—Markings, and Part 4—Signals. The proposed changes included herein are intended to expedite traffic, promote uniformity, improve safety, and incorporate technology advances in traffic control device application.

DATES: Submit comments on or before June 30, 2000.

ADDRESSES: Signed, written comments should refer to the docket number that appears at the top of this document and must be submitted to the Docket Clerk, U.S. DOT Dockets, Room PL–401, 400 Seventh Street, SW., Washington, DC 20590–0001. All comments received will be available for examination at the above address between 9 a.m. and 5 p.m., e.t., Monday through Friday, except Federal holidays. Those desiring notification of receipt of comments must include a self-addressed, stamped postcard.

FOR FURTHER INFORMATION CONTACT: For information regarding the notice of proposed amendments contact Ms. Linda Brown, Office of Transportation Operations, Room 3408, (202) 366–2192, or Mr. Raymond Cuprill, Office of Chief Counsel, Room 4217, (202) 366–0834, Department of Transportation, Federal Highway Administration, 400 Seventh Street, SW., Washington, DC 20590.

SUPPLEMENTARY INFORMATION:

Electronic Access

Internet users may access all comments received by the U.S. DOT Dockets, Room PL–401, by using the universal resource locator (URL): see ''Addresses'' *http:/dms.dot.gov*. It is available 24 hours each day, 365 days each year. Please follow the instructions online for more information and help. An electronic copy of this notice of proposed amendment may be downloaded using a modem and suitable communications software from the Government Printing Office's Electronic Bulletin Board Service at (202) 512–1661. Internet users may reach the Office of the Federal Register's home page at: *http://www.nara.gov/fedreg* and the Government Printing Office's database at: *http://www.access.gpo.gov/nara.*

The text for the proposed sections of the MUTCD is available from the FHWA Office of Transportation Operations (HOTO–1) or from the FHWA Home Page at the URL: *http://www.ohs.fhwa.dot.gov/operations/mutcd*. Please note that the proposed rewrite sections contained in this docket for the MUTCD Part 1, Part 3, and Part 4 will take approximately 8 weeks from the date of publication before they will be available at this web site.

Background

The 1988 MUTCD with its revisions are available for inspection and copying as prescribed in 49 CFR part 7. It may be purchased for $57.00 (Domestic) or $71.25 (Foreign) from the Superintendent of Documents, U.S. Government Printing Office, P.O. Box 371954, Pittsburgh, PA 15250–7954, Stock No. 650–001–00001–0. This notice is being issued to provide an opportunity for public comment on the desirability of proposed amendments to the MUTCD. Based on the comments received and its own experience, the FHWA may issue a final rule concerning the proposed changes included in this notice.

The National Committee on Uniform Traffic Control Devices (NCUTCD) has taken the lead in this effort to rewrite and reformat the MUTCD. The NCUTCD is a national organization of individuals

from the American Association of State Highway and Transportation Officials (AASHTO), the Institute of Transportation Engineers (ITE), the National Association of County Engineers (NACE), the American Public Works Association (APWA), and other organizations that have extensive experience in the installation and maintenance of traffic control devices. The NCUTCD voluntarily assumed the arduous task of rewriting and reformatting the MUTCD. The NCUTCD proposal is available from the U.S. DOT Dockets (see address above). Pursuant to 23 CFR part 655, the FHWA is responsible for approval of changes to the MUTCD.

Although the MUTCD will be revised in its entirety, it is being completed in phases due to the enormous volume of text. The FHWA has reviewed the NCUTCD's proposals for the MUTCD. The summary of proposed changes for Parts 3, 4, and 8 was published as Phase 1 of the MUTCD rewrite effort in a previous notice of proposed amendment dated January 6, 1997, at 62 FR 691. The summary of proposed changes for Parts 1 and 7 was published as phase 2 of the MUTCD rewrite effort in a previous notice of proposed amendment dated December 5, 1997, at 62 FR 64324. The summary of proposed changes for Chapters 2A, 2D, 2E, 2F, and 2I was published as Phase 3 of the MUTCD rewrite effort in a previous notice of proposed amendment dated June 11, 1998, at 63 FR 31950. The summary of proposed changes for Chapters 2G—Tourist Oriented Directional Signs, Chapter 2H—Recreational and Cultural Interest Signs, and Part 9—Traffic Control for Bicycles was published as Phase 4 of the MUTCD rewrite effort in a previous notice of proposed amendment dated June 24, 1999, at 64 FR 33802. The summary of proposed changes for Chapter 2C—Warning Signs and Part 10—Traffic Control for Highway-Light Rail Transit Grade Crossings was published as Phase 5 of the MUTCD rewrite effort in a previous notice of proposed amendment dated June 24, 1999, at 64 FR 33806. The summary of proposed changes for Chapter 2B—Regulatory Signs, Part 5—Traffic Control for Low-Volume Rural roads, and update information for Part 8—Traffic Control at Highway-Rail Grade Crossings was published as Phase 6 of the MUTCD rewrite effort in a previous notice of proposed amendment.

The summary of proposed changes for Part 6—Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations will be published as Phase 8 of the MUTCD rewrite effort in a future notice of proposed amendment. This notice of proposed amendment is Phase 7 of the MUTCD rewrite effort and includes the summary of proposed changes for MUTCD Part 1—General Provisions, Part 3—Markings, and Part 4—Signals.

The proposed new style of the MUTCD would be a 3-ring binder with 8½ x 11 inch pages. Each part of the MUTCD would be printed separately in a bound format and then included in the 3-ring binder. If someone needed to reference information on a specific part of the MUTCD, it would be easy to remove that individual part from the binder. The proposed new text would be in column format and contain four categories as follows: (1) Standards—representing ''shall'' conditions; (2) Guidance—representing ''should'' conditions; (3) Options—representing ''may'' conditions; and (4) Support—representing descriptive and/or general information. This new format would make it easier to distinguish standards, guidance, and optional conditions for the design, placement, and application of traffic control devices. The adopted final version of the new MUTCD will be in metric and English units. Dual units will be shown in the MUTCD particularly for speed limits, guide sign distances, and other measurements which the public must read.

The FHWA invites comments on the proposed new text for the MUTCD Part 1, Part 3, and Part 4. Summaries of the proposed significant changes contained in these parts are included in the following discussions:

Discussion of Proposed Amendments to Part 1—General Provisions

The summary of proposed changes for Part 1 was published as Phase 2 of the MUTCD rewrite effort in a previous notice of proposed amendment dated December 5, 1997. Since that time, several more Phases were published with additional definitions. The following are the most significant proposed revisions to Part 1:

1. In Section 1A.11, paragraph 3, the FHWA proposes to include a flow chart diagram showing the process for changes to the MUTCD and for experimentation with new traffic control devices and their application.

2. In Section 1A.14, the definitions for the following terms apply only to Part 4—Signals. Therefore, the FHWA proposes to delete them from Part 1—General Provisions and discuss them in Part 4 only. The terms are: actuated operation, actuation, backplate, conflict monitor, controller assembly, controller unit, coordination, cycle length, dark mode, detector, flasher, full-actuated operation, interval, interval sequence, louver, pedestrian change interval, pedestrian clearance time, pedestrian signal head, permitted mode, preemption control, priority control, protected mode, ramp control signal, red clearance interval, signal lens, signal phase, signal section, signal system, signal visor, signal warrant, steady mode, visibility-limited signal indication, and yellow change interval. The FHWA proposes to only include definitions in Part 1A.14 for terms that are used in more than one specific part of the MUTCD.

3. In Section 1A.14, the FHWA proposes to add the following definitions which appear in various sections of the MUTCD: Paved—A bituminous surface treatment, mixed bituminous concrete, or portland cement concrete roadway surface which has both a structural (weight bearing) and a sealing purpose for the roadway. Rural—A type of roadway as defined by the jurisdictions in compliance with their legislation, statute, regulations, and policies. Urban—A type of roadway as defined by the jurisdictions in compliance with their legislation, statute, regulations, and policies.

4. The FHWA proposes to add a new Section 1A.15 entitled, ''Abbreviations.'' This section will list the standard abbreviations for word messages used in connection with traffic control devices.

Discussion of Proposed Amendments to Part 3—Markings

The summary of proposed changes for part 3 was published as Phase 1 of the MUTCD rewrite effort in a previous notice of proposed amendment dated January 6, 1997. Since that time, a number of changes have been suggested to FHWA by the NCUTCD and others, and a number of applicable recommendations were made in the ''Older Driver Highway Design Handbook.'' [1] Section numbers used herein refer to the proposed text in the notice of proposed amendments dated January 6, 1997.

The FHWA has included Sections 3B.1, 3B.2, and 3B.3 in this notice so that those reviewing the following part 3 sections are aware of the Final Rule wording of these sections with regards to center lines and edge lines.

1. In Section 3B.2, the FHWA proposes to add a standard, which was inadvertently omitted from the proposed amendment dated January 6,

[1] ''Older Driver Highway Design Handbook,'' Report No. FHWA–RD–99–045, available from the FHWA Research and Technology Report Center, 9701 Philadelphia Court, Unit Q, Lanham, Maryland 20706.

1997, at 62 FR 691. The standard is that lane line markings shall be used on all Interstate highways and freeways.

2. In Section 3B.4, paragraph 2, the FHWA proposes to add Figure 3–9a to show more examples of using dotted line markings in intersections to extend longitudinal line markings. This proposed Figure is in response to older driver research that shows that motorists may benefit by having these additional markings.

3. In Section 3B.9, paragraphs 2, 4, and 6, the FHWA proposes to add a ''Yield Line'' marking as an optional marking where it is important to indicate the point behind which vehicles are required to yield. The proposed Figure 3–24 provides an illustration of these markings.

4. In Section 3B.12, paragraph 19, the FHWA proposes to add a ''Yield Ahead'' triangle symbol marking for optional use in advance of intersections where approaching traffic will encounter a YIELD sign. The proposed Figure 3–25 provides an illustration of these markings.

5. In Section 3B.13, the FHWA proposes to differentiate between types of preferential lanes. The diamond pavement marking symbol is proposed for exclusive HOV lane use. In situations where a preferential lane is not an HOV lane, then the word message (Bus, Taxi, etc.) or symbol (Bike, etc.) for the type of traffic allowed would be used.

6. In Section 3B.15, paragraph 5, the FHWA proposes to add ''paved median noses'' to the locations that should have retroreflective solid yellow markings. This addition is in response to recommendations contained in the ''Older Driver Highway Design Handbook'' (see footnote 1) which shows that motorists may benefit by having these additional markings.

7. The FHWA proposes to add a new Section 3B.16 to provide standards for the longitudinal lane line markings for the various types of physically separated, reversible, non-reversible, and left and right side concurrent flow preferential lanes for motorized vehicles. The proposed Figure 3–23 provides an illustration of these markings. Furthermore, there is guidance on marking the neutral area between a preferential use lane and a regular traffic lane when the distance between them is greater than 1.2 m (4 ft).

8. The FHWA proposes to add a new Section 3B.17 to incorporate standard markings for roundabouts since roundabouts are becoming more commonly used. The proposed Figure 3–26 provides an illustration of typical roundabout markings.

9. The FHWA proposes to add a new Section 3B.18 to incorporate optional standard markings for other circular intersections including rotaries, traffic circles, and residential traffic calming designs. The proposed Figure 3–26a provides an illustration of typical markings for other circular intersections.

10. The FHWA proposes to add a new Section 3B.19 to provide pavement markings to assist motorists in identifying the locations of speed humps. The proposed Figure 3–27 and Figure 3–28 provide illustrations of typical speed hump markings.

11. The FHWA proposes to add a new Section 3B.20 to provide for pavement markings in advance of a speed hump where added visibility is desired or where a speed hump may not be expected. The proposed Figure 3–29 provides an illustration of a typical advanced speed hump marking.

Discussion of Proposed Amendments to Part 4—Signals

The summary of proposed changes for Part 4 was published as Phase 1 of the MUTCD rewrite effort in a previous notice of proposed amendment dated January 6, 1997. Since that time, a number of changes have been suggested to FHWA, and a number of applicable recommendations were made in the ''Older Driver Highway Design Handbook'' (see footnote 1). Section numbers used herein refer to the proposed text in the notice of proposed amendments dated January 6, 1997.

1. The FHWA proposes to change the name of Section 4B.2 to ''Basis of Installation or Removal of Traffic Control Signals'' to reflect that the section addresses both the installation and removal of traffic control signals. Under OPTION, a series of steps that may be considered in removing a traffic control signal is proposed.

2. In Section 4C.1, paragraph 12, the category OPTION is added and a new paragraph (d) is proposed for the various data that may be included in the engineering study for determining whether a traffic control signal is needed: ''Information about nearby facilities and activity centers that serve the elderly, people with disabilities, and/or requests from people with disabilities for accessible crossing improvements along this route. These people may not be adequately reflected in the pedestrian volume count if the lack of a signal restrains their mobility.'' The FHWA is withdrawing the proposal that was made in the January 6, 1997, notice of proposed amendments to move the School Crossing Warrant from Part 4 to Section 7D.4. (See 62 FR 691, FHWA Docket No. 96–47 scanned into DOT's Document Management System as Docket No. 97–2295.) The FHWA proposes to keep it as Warrant 5 in Section 4C.1. However, the FHWA proposes to include a reference in Chapter 7D.

3. In Section 4D.3, paragraph 3, a new GUIDANCE is proposed: ''Safety considerations should include the installation, where appropriate, of accessible pedestrian signals that provide information in nonvisual format (including audible tones, verbal messages, and/or vibrotactile information). Provisions for accessible signals are presented in Sections 4E.6 and 4E.8.'' This proposed change reflects the intent of language on Bicycle Transportation and Pedestrian Walkways contained in section 1202 of the Transportation Equity Act for the 21st Century, Public Law 105–178, 112 Stat. 107 (1998).

4. In Section 4D.4, paragraph 2, the FHWA is withdrawing its proposal (See 62 FR 691, FHWA Docket No. 96–47 scanned into DOT's Document Management System as Docket No. 97–2295) to delete the phrase ''Unless otherwise determined by law'' relative to the meaning of signal indications. The FHWA proposes to keep this statement because it encourages State and local entities to achieve uniform rules of the road that are in accord with Chapter 11, Rules of the Road, in the ''Uniform Vehicle Code and Model Traffic Ordinance,'' (UVCMTO), Revised 1992, published by the National Committee on Uniform Traffic Laws and Ordinances in Evanston, Illinois.

5. In Section 4D.4, the FHWA proposes to revise paragraph 2c(1), paragraph 2, to delete the words, ''or a RED ARROW indication is displayed.'' This proposed deletion is in response to recommendations contained in the ''Older Driver Highway Design Handbook'' (see footnote 1) which shows motorist confusion as to the meaning of the red arrow indication. In Figure 4–7 in Section 4D.16, the typical arrangement of lenses c and d are appropriately changed to eliminate the RED ARROW and to replace it with the CIRCULAR RED.

6. The FHWA proposes to delete Section 4D.4, paragraph 2c(2). This proposed deletion is in response to recommendations contained in the ''Older Driver Highway Design Handbook'' (see footnote 1) which shows motorist confusion as to the meaning of the red arrow indication.

7. In Section 4D.4, the FHWA proposes to revise paragraph 2c(3) to

delete ''or RED ARROW.'' This proposed deletion is in response to recommendations contained in the ''Older Driver Highway Design Handbook'' (see footnote 1) which shows motorist confusion as to the meaning of the red arrow indication.

8. In Section 4D.4, the FHWA proposes to revise paragraph 2d(3) to delete ''Flashing RED ARROW and.'' This proposed deletion is in response to recommendations contained in the ''Older Driver Highway Design Handbook'' (see footnote 1) which shows motorist confusion as to the meaning of the red arrow indication.

9. In Section 4D.5, the FHWA proposes to delete paragraph 3(d) that reads, ''A steady RED ARROW indication shall be displayed when it is intended to prohibit traffic, except pedestrians directed by a pedestrian signal head, from entering the intersection or other controlled area to make the indicated turn. Turning on a steady RED ARROW indication shall not be permitted.'' This deletion would require a CIRCULAR RED signal indication to be used instead of a RED ARROW for right and left-turn indications. This is in response to recommendations contained in the ''Older Driver Highway Design Handbook'' (see footnote 1) which shows motorist confusion as to the meaning of the red arrow indication. The compliance date proposed by FHWA for this change is 3 years after the effective date of the final rule. This would allow State and local agencies time to implement this proposed change.

10. The FHWA proposes to delete Section 4D.5, paragraph 3(e)(2) that reads, ''Shall not be displayed in conjunction with the change from a RED ARROW indication to a GREEN ARROW indication.'' This would delete the reference to the RED ARROW since the FHWA proposes to no longer use RED ARROWS in the MUTCD.

11. In Section 4D.5, the FHWA proposes to revise paragraph 3(e)(4) to read, ''Shall be terminated by a CIRCULAR YELLOW indication or a CIRCULAR RED indication except.'' This would delete the reference to the RED ARROW since the FHWA proposes to no longer use RED ARROWS in the MUTCD.

12. In Section 4D.5, the FHWA proposes to revise paragraph 4, OPTION, to delete the words, ''RED ARROW.'' This would delete the reference to the RED ARROW since the FHWA proposes to no longer use RED ARROWS in the MUTCD.

13. In Section 4D.6, paragraph 2, the FHWA proposes to add a new STANDARD which defines a leading protected-only left turn phase as one in which the GREEN ARROW, YELLOW ARROW, and CIRCULAR RED is given to vehicles turning left from a particular street before the CIRCULAR GREEN indication is given to the through movement on the same street. This proposed addition to the MUTCD is currently used in the field and is recommended in the ''Older Driver Highway Design Handbook'' (see footnote 1).

14. In Section 4D.6, paragraph 3, the FHWA proposes to add a new OPTION to read, ''A leading protected-only left turn phase may be considered if there is not a sufficient number of acceptable gaps for the left-turning movement.'' This proposed addition to the MUTCD is based on recommendations contained in the ''Older Driver Highway Design Handbook'' (see footnote 1) which shows a crash reduction with the use of a leading protected-only left-turn phase.

15. In Section 4D.6, the FHWA proposes to delete paragraph 2b(1) which reads, ''RED, YELLOW, and GREEN left-turn ARROW indications only. Only one of the three lenses shall be illuminated at any given time. A signal instruction sign shall not be required with this set of signal indications. If used, it shall be a LEFT ON GREEN ARROW ONLY sign (R10–5) or.'' This deletion would require a CIRCULAR RED signal indication to be used instead of a RED ARROW for left-turn indications. This is in response to recommendations contained in the ''Older Driver Highway Design Handbook'' (see footnote 1) that shows confusion as to the meaning of the red arrow indication. The compliance date for this change is proposed to be 3 years after the effective date of the final rule. This would allow State and local agencies time to implement this proposed change.

16. In Section 4D.7, the FHWA proposes to revise paragraph 2(a) to replace ''RED ARROW'' with ''CIRCULAR RED,'' and add ''along with a RIGHT TURN SIGNAL sign, R10–10'' at the end of the sentence. This would delete the reference to the RED ARROW since the FHWA proposes to no longer use RED ARROWS in the MUTCD.

17. In Section 4D.7, the FHWA proposes to delete paragraph 2 (1) that reads, ''RED, YELLOW, and GREEN right-turn ARROW indications only. One of the three lenses shall be illuminated at any given time. A signal instruction sign shall not be required with this set of signal indications. If used, it shall be a RIGHT ON GREEN ARROW ONLY sign (R10–5a); or.'' The purpose of this proposed change is to require a CIRCULAR RED instead of a RED ARROW for right-turn indications.

18. In Section 4D.8, the FHWA proposes to revise paragraph 3 to no longer allow the display of red arrows on any signal face. The compliance date for this change is proposed to be 3 years after the effective date of the final rule. This would allow State and local agencies time to implement this proposed change.

19. In Section 4D.11, the FHWA proposes to revise paragraphs 3 (b) and 3 (c) to delete the reference to red arrows.

20. In Sections 4D.15 and 4D.17, the FHWA proposes to revise these sections to be consistent with a new maximum vertical viewing angle of 20 degrees. In Section 4D.15, paragraph 1d (2) and Section 4D.17, new paragraph 5, the FHWA proposes to require a maximum height of 7.8 m (25.6 ft) to the top of signal housings mounted above the pavement with a sliding scale of 6.4 m to 7.8 m (21 to 25.6 ft) maximum height for viewing distances between 12 m and 16 m (40 and 53 ft). Vertical viewing angles of as high as 23.8 degrees are implicitly allowed via the present wording of the MUTCD. This has been identified as a problem area. Ergonomic statistics demonstrated that tall motorists, with these extreme vertical angle placements, are unable to view the top of the signal face due to the blockage from the vehicle ceiling line. Therefore the FHWA proposes a maximum vertical viewing angle of 20 degrees.

21. In Section 4D.16, the FHWA proposes to revise paragraph 9 (a) and (b) to delete the words, ''Left-turn RED ARROW,'' and ''Right-turn RED ARROW.'' This would delete the reference to the RED ARROW since FHWA proposes to no longer display red arrows on any signal face.

22. In Section 4D.16, the FHWA proposes to insert a new paragraph 15 at the end of the section to provide supporting information for 300 mm (12-in) signals. The new paragraph will read, ''The use of 300 mm (12-in) lenses or higher intensity 200 mm (8-in) lenses can be used to assist older drivers in decisionmaking tasks further from the intersection where traffic density is lower and there are fewer potential conflicts with other vehicles.'' The FHWA believes this proposed change will assist older drivers in the decisionmaking tasks encountered at roadway intersections.

23. In Section 4D.17, the FHWA proposes to add a new paragraph 16 to explain the benefits of using a backplate on signals. The FHWA believes the use of a backplate will help older drivers and enhance the signal conspicuity.

24. In Section 4E.4, paragraph 8, the FHWA proposes to revise the GUIDANCE as follows: ''For crosswalks where the pedestrian enters the crosswalk more than 30 m (100 ft) from the pedestrian signal head indications, the symbols should be at least 225 mm (9 in) high.'' The MUTCD presently provides that where the pedestrian enters the crosswalk more than 20 m (60 ft) from the pedestrian signal head indication, the pedestrian symbols should be at least 225 mm (9 in) high. However research has found that the lesser, 150 mm (6 in) pedestrian symbols, are adequate for distances of up to 30 m (100 ft). The subjects used in the research included 48 seniors age 62 and older. The research included incandescent, light emitting diode (LED) and Fiber-optic pedestrian signals.

25. The FHWA proposes to add a new Section 4E.6, Accessible Pedestrian Signals and a new Section 4E.8, Accessible Pedestrian Detectors. In these new sections SUPPORT information would be provided on the primary techniques that pedestrians who have visual disabilities use to cross the street at signalized intersections. Information would also be provided on the availability of local organizations that can act as advisors to engineers when consideration is being given to the installation of accessible pedestrian signals. GUIDANCE would be provided on factors to consider in the engineering study to decide whether to install an accessible pedestrian signal. Finally, STANDARDS and GUIDANCE would be provided for such installations (if used). These would be useful to engineers in designing installations, to suppliers by providing a degree of standardization for these devices, and to pedestrians who have visual disabilities in assuring that their needs are met and that installations of accessible pedestrian signals are standardized. Based on this change, the section numbers for 4E.6, Pedestrian Signal Timing, would be renumbered as Section 4E.7. Section 4E.7, Pedestrian Intervals and Phases, would be renumbered as Section 4E.9.

26. In redesignated Section 4E.9 (formerly 4E.7), paragraph 4, the FHWA proposes to revise the GUIDANCE to change the WALK interval from a range of 4 to 7 seconds to a minimum of 7 seconds. In paragraph 9, the FHWA proposes to include an OPTION that if pedestrian volumes and characteristics do not require a 7-second WALK interval, a WALK interval as short as 4 seconds may be used.

27. In redesignated Section 4E.9 (formerly 4E.7), paragraph 6, the FHWA proposes an OPTION that allows the use of new technology for pedestrian detection as an alternative to using lower walking speeds for slower pedestrians. There has been a successful experiment in Portland, Oregon, on the use of passive methods to detect pedestrians in the crosswalk.[2] Such equipment can detect pedestrians that need more time to complete their crossing. The equipment extends the length of the pedestrian clearance time (flashing DON'T WALK) for that cycle to allow pedestrians to complete their crossing before cross traffic begins.

28. In Section 4J.3, paragraph 1, the FHWA proposes to increase the minimum height and width dimensions of each DOWNWARD GREEN ARROW, YELLOW X, and RED X signal face from 300 mm (12 in) to 450 mm (18 in). The FHWA believes this proposed change will ensure that these critical signals are adequately conspicuous to capture the drivers' attention. The FHWA is also including an OPTION to use 300 mm (12 in) lane-use control signal faces in areas having minimal visual clutter and having speeds of 70 km/h (45 mph) or less.

29. The FHWA proposes to add a new Section 4L, In-Roadway Lights, to the MUTCD. In-Roadway Lights are special types of highway traffic signals. They consist of a series of flashing light units embedded across the roadway to warn road users that they are approaching a condition on or adjacent to the roadway that might not be readily apparent and might require the road users to slow down and possibly come to a stop. These conditions include, but are not limited to, marked crosswalks that are not controlled by STOP signs, YIELD signs, or traffic control signals.

30. The proposed new Sections 4L.1 and 4L.2 would provide STANDARDS and GUIDANCE for the design and operation of In-Roadway Lights (if used) installations. The STANDARDS, among other things, would provide: (1) For the installation of In-Roadway Lights parallel to the edge of the crosswalk, (2) For the operation to be initiated based on pedestrian actuation (active or passive), (3) For the operation to cease at a predetermined time after the actuation or with passive detection when the pedestrian clears the crosswalk, (4) For the installation at marked crosswalks only with applicable warning signs, and (5) For the height of the In-Roadway Lights not to exceed a height of 20 mm (3/4 in).

[2] Kloos, W., ''Implementing Passive Methods for Detecting Pedestrians,'' presentation at the 1998 Annual Meeting, Institute of Transportation Engineers, Washington, DC.

Rulemaking Analysis and Notices

All comments received before the close of business on the comment closing date indicated above will be considered and will be available for examination in the docket at the above address. Comments received after the comment closing date will be filed in the docket and will be considered to the extent practicable, but the FHWA may issue a final rule at any time after the close of the comment period. In addition to late comments, the FHWA will also continue to file in the docket relevant information that becomes available after the comment closing date, and interested persons should continue to examine the docket for new material.

Executive Order 12866 (Regulatory Planning and Review) and DOT Regulatory Policies and Procedures

The FHWA has determined preliminarily that this action will not be a significant regulatory action within the meaning of Executive Order 12866 or significant within the meaning of Department of Transportation regulatory policies and procedures. It is anticipated that the economic impact of this rulemaking would be minimal. The new standards and other changes proposed in this notice are intended to improve traffic operations and safety, and provide additional guidance, clarification, and optional applications for traffic control devices. The FHWA expects that these proposed changes will create uniformity and enhance safety and mobility at little additional expense to public agencies or the motoring public. Therefore, a full regulatory evaluation is not required.

Regulatory Flexibility Act

In compliance with the Regulatory Flexibility Act (5 U.S.C. 601–612), the FHWA has evaluated the effects of this proposed action on small entities. This notice of proposed rulemaking adds some new and alternative traffic control devices and traffic control device applications. The proposed new standards and other changes are intended to improve traffic operations and safety, expand guidance, and clarify application of traffic control devices. The FHWA hereby certifies that these proposed revisions would not have a significant economic impact on a substantial number of small entities.

Unfunded Mandates Reform Act of 1995

This proposed rule would not impose a Federal mandate resulting in the expenditure by State, local, and tribal governments, in the aggregate, or by the

private sector, of $100 million or more in any one year (2 U.S.C. 1532).

Executive Order 13132 (Federalism)

This proposed action has been analyzed in accordance with the principles and criteria contained in Executive Order 13132 dated August 4, 1999, and it has been determined that it would not have a substantial direct effect or sufficient federalism implications on States that would limit the policymaking discretion of the States. Nothing in this document directly preempts any State law or regulation.

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

This proposed action does not contain a collection of information requirement for purposes of the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 *et seq.*

Executive Order 12988 (Civil Justice Reform)

This proposed action meets applicable standards in Sections 3(a) and 3(b)(2) of Executive Order 12988, Civil Justice Reform, to minimize litigation, eliminate ambiguity, and reduce burden.

Executive Order 13045 (Protection of Children)

The FHWA has analyzed this proposed action under Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. This is not an economically significant action and does not concern an environmental risk to health or safety that may disproportionately affect children.

Executive Order 12630 (Taking of Private Property)

This proposed action would not effect 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 proposed action for the purpose of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 *et seq.*) and has determined that it would 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.

(23 U.S.C. 109(d), 114(a), 315, and 402(a); 23 CFR 1.32; 49 CFR 1.48)

Issued on: December 17, 1999.

Kenneth R. Wykle,

Administrator.

BILLING CODE 4910–22–P

Manual on Uniform Traffic Control Devices

Introduction

Standard

Traffic control devices are all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over or adjacent to a street, highway, pedestrain facility, or bikeway by authority of a public body or official having jurisdiction.

The Manual on Uniform Traffic Control Devices (MUTCD) is incorporated by reference in 23 Code of Federal Regulations (CFR), Parts 655, Subpart F and recognized as the national standard for traffic control devices on all roads open to public travel. The policies and procedures of the Federal Highway Administration (FHWA) to obtain basic uniformity of traffic control devices are described in 23 CFR 655, Subpart F.

Support:

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

The Secretary if Transportation, under authority granted by legislation in 1966, decreed that traffic control devices on all roads in each State shall be in substantial conformance with the standards issued or endorsed by FHWA.

23 CFR, Part 655.603 adopts the MUTCD as the national standard for any street, highway, or bicycle trail open to public travel. The Uniform Vehicle Code (UVC) is one of the referenced documents contained in the MUTCD. The UVC contains a model set of motor vehicle and traffic laws for use throughout the Nation. As with the MUTCD, the UVC also includes language in Section 15–117 which states that, ''No person shall install or maintain in any area of private property used by the public any sign, signal, marking or other device intended to regulate, warn or guide traffic unless it conforms with the State manual and specifications adopted under Section 15–104.'' Section 15–104 of the UVC adopts the MUTCD as the standard for conformance.

EVOLUTION OF THE MUTCD

Year	Name	Month/year revised
1927	Manual and Specifications for the Manufacture, Display, and Erection of U.S. Standard Road Markers and Signs (for rural roads).	4/29, 12/31
1930	Manual on Street Traffic Signs, Signals, and Markings (for urban streets).	No revisions
1935	Manual on Uniform Traffic Control Devices for streets and Highway (MUTCD).	2/39
1942	MUTCD—War Emergency Edition	No revisions
1948	MUTCD	9/54
1961	MUTCD	No revisions
1971	MUTCD	11/71, 4/72, 3/73, 10/73, 6/74, 6/75, 9/76, 12/77
1978	MUTCD	12/79, 12/83, 9/84, 3/86
1988	MUTCD	1/90, 3/92, 9/93, 11/94, 12/96, 6/98, 6/99

Table I–1, Evolution of the MUTCD

Part 1. General Provisions

1A.1 Purpose of Traffic Control Devices

Support:

The purpose of traffic control devices and principles for their use is to promote highway safety and efficiency by providing for the orderly movement of all road users on streets and highways throughout the nation.

Traffic control devices notify road users of regulations and provide warning and guidance needed for the safe, uniform, and efficient operation of all elements of the traffic stream.

Standard:

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

1A.2 Principles of Traffic Control Devices

Support:

This Manual contains the basic principles that govern the design and use of traffic control devices for all streets and highways open to public travel regardless of type or class or the governmental body having jurisdiction. The text specifies the restriction on the use of a device if it is intended for limited application or for a specific system. It is important that these principles be given primary consideration in the selection and application of each device.

Guidance:

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

1. Fulfill a need.
2. Command attention.
3. Convey a clear, simple meaning.
4. Command respect from road users.
5. Give adequate time for proper response.

The following aspects of traffic control devices should be considered to ensure that these requirements are met: design; placement and operation; maintenance; and uniformity.

Support:

The term speed can mean the 85th percentile, design, average, operating, posted or statutory speed. The definitions of these and other specified speed terms are contained in Section 1A.14, *Definition of Words and Phrases.*

Guidance:

The policies and procedures of the FHWA to obtain basic uniformity of traffic control devices on all streets and highways are described in 23 CFR 655 Subpart F. The actions required for road users to obey regulatory devices should be specified by state statute, or in cases not covered by state statute, by local ordinance or resolution consistent with national standards.

The use of traffic control devices should provide the reasonable and prudent road user with the information necessary to safely and lawfully use the streets, highways, pedestrian facilities, and bikeways. Furthermore, the selection, application, design, placement, installation, operation, and maintenance of traffic control devices should be based on the minimum capabilities described in the Uniform Vehicle Code that a road user must possess to lawfully operate a vehicle.

Support:

Uniformity of the meaning of traffic control devices is vital to their effectiveness. The meanings ascribed in devices in this Manual are in general accord with the documents mentioned in Section 1A.12.

1A.3 Design of Traffic Control Devices

Guidance:

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

Standard:

All new symbols and sign colors shall be adopted using the procedures described in Section 1A.11. All symbols shall be unmistakably similar to or mirror images of those shown herein. Symbols and colors shall not be modified.

Guidance:

Other aspects of a device's design should be modified only where there is demonstrated need. Modifications should be kept to a minimum and should be done in a way that will preserve the essential characteristics of the device's appearance.

Options: State and local highway agencies may develop word message signs to notify road users of special regulations or to warn of special situations or hazards. Unlike with symbol signs and colors, new word message signs may be used without the need for experimentation. With the exception of symbols and colors, minor modifications in the specific design elements of a device may be made provided the essential appearance characteristics are preserved. Although the standard design of symbol signs cannot be modified, it may be appropriate to change the orientation of the symbol to better reflect the direction of travel.

1A.4 Placement and Operation of Traffic Control Devices

Guidance:

Placement of the device should assure that it is within the cone of vision of the

viewer so that it will command attention; that it is appropriately positioned with respect to the location, object, or situation to which it applies to aid in conveying the proper meaning; and that its location, combined with suitable legibility, is such that a road user has adequate time to make the proper response in both day and night conditions.

Traffic control devices should be placed and operated in a uniform and consistent manner to assist road users in properly responding to the device, based on their previous exposure to similar traffic control situations.

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

1A.5 Maintenance of Traffic Control Devices

Guidance:

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

Physical maintenance of traffic control devices should be performed to ensure that legibility is retained, that the device is visible, and that it functions properly in relation to other traffic control devices in the vicinity.

Support:

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

1A.6 Uniformity of Traffic Control Devices

Support:

Uniformity of devices simplifies the task of the road user because it aids in recognition and understanding, thereby reducing perception/reaction time. It aids road users, police officers, and traffic courts by giving everyone the same interpretation. It aids public highway and traffic officials through efficiency in manufacture, installation, maintenance, and administration. Simply stated, uniformity means treating similar situations in the same way. The use of uniform traffic control devices does not, in itself, constitute uniformity. A standard device used where it is not appropriate is as objectionable as a nonstandard device; in fact, this may be worse, because such misuse may result in disrespect at those locations where the device is needed.

1A.7 Responsibiloity for Traffic Control Devices

Standard:

The responsibility for the design, placement, operation, maintenance, and uniformity of traffic control devices shall rest with the public agency or the official having jurisdiction. 23 CFR 655.603 adopts the MUTCD as the national standard for all traffic control devices installed on any street, highway, or bicycle path open to public travel. When a State or other Federal agency MUTCD or supplement is required, they shall be in substantial conformance with the national MUTCD.

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

Support:

The Uniform Vehicle Code has the following provision in Section 15–104 for the adoption of a uniform Manual:

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

''(b) The Manual adopted pursuant to subsection (a) shall have the force and effect of law.''

Additionally, States are encouraged to adopt Uniform Vehicle Code, Section 15–117 which states that, ''No person shall install or maintain in any area of private property used by the public any sign, signal, marking or other device intended to regulate, warn of guide traffic unless it conforms with the State manual and specifications adopted under § 15–104.''

1A.8 Placement Authority

Standard:

Traffic control devices and other signs or messages within the highway right-of-away shall be placed only by a public authority or the official having jurisdiction, for the purpose of regulating, warning, or guiding traffic.

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

Guidance:

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

Standard:

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

Support:

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

1A.9 Engineering Study or Judgment Required

Standard:

This Manual describes the application of traffic control devices, but shall not be a legal requirement for their installation, unless so stated in any specific section.

Guidance:

The decision to use a particular device at a particular location should be made on the basis of either an engineering study or the application of engineering judgment. Thus while this Manual provides standards for design and application of traffic control devices, the Manual should not be considered a substitute for engineering judgment.

Qualified engineers should exercise engineering judgment inherent in the selection and application of traffic control devices, just as in the location and design of the roads and streets which the devices complement. Jurisdictions with responsibility for traffic control that do not have qualified engineers on their staffs, should seek assistance from the State transportation agency, their county, a nearby large city, or a traffic engineering consultant.

1A.10 Meaning of STANDARD, GUIDANCE, OPTION, AND SUPPORT

Support:

The standard, guidance, option, and support material described in this edition of the MUTCD provide the engineer with the information needed to

make appropriate decisions regarding the use of traffic control devices on streets and highways. This is organized to better differentiate between required conditions for traffic control devices (standards) that must be satisfied and other conditions (guidance and options) which may or may not be applicable, depending upon the particular circumstances of a situation.

Throughout this Manual the headings ''Standard,'' ''Guidance,'' ''Option,'' and ''Support'' are used to classify the nature of the text that follows.

Standard:

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

1. Standard: A statement of required, mandatory or specifically prohibitive practice regarding a traffic control device. All standards are labeled and the headings appear in uppercase, blocked, and bold type. The word ''shall'' is typically used. Standards are sometimes modified by options.

2. Guidance: A statement of recommended but not mandatory practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. All guidance statements are labeled and the headings appear in uppercase shaded type. The word ''should'' is typically used. Guidance statements are sometimes modified by options.

3. Option: A statement of practice which is a permissive condition and carries no recommendation or mandate. Options may contain allowable modifications to a standard and/or guidance. All option statements are labeled and the headings appear in lowercase normal type. The word ''may'' is typically used.

4. Support: An informational statement which does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. Support statements are labeled and the headings appear in uppercase normal type.

Support:

Figures, tables, and illustrations supplement the text and might constitute a Standard, Guidance, Option, or Support. The reader can refer to the appropriate text to determine the meaning of the figure, table, or illustration.

1A.11 Manual Changes, Interpretations and Authority to Experiment

Standard:

Use of devices that do not conform to the provisions of this Manual shall be prohibited unless the provisions of this section are followed.

Support:

Continuing advances in technology will produce changes in the highway, the vehicle, and in road user proficiency, and portions of the system of control devices in this Manual will require updating. In addition, unique situations often arise for device applications which might require interpretation or clarification of this Manual. It is important to have a procedure for recognizing these developments and for introducing new ideas and modifications into the system.

Guidance:

Requests for any change, interpretation or permission to experiment should be sent to the Federal Highway Administration (FHWA), Office of Transportation Operation (HOTO), 400 Seventh Street, SW., Washington, D.C. 20590. The request to experiment may be sent directly to HOTO with a copy to the FHWA Division Office or the request may be sent to the FHWA Division Office and then forwarded to HOTO. Diagrams showing the process for changes to the MUTCD and experimentation with traffic control devices are included after this section.

1. Change—A change includes consideration of new devices to replace a present standard device, additional devices to be added to the list of standard devices, or revisions to recommended application or meaning criteria.

Request for a change in the Manual should contain the following information:

(a) A statement indicating what change is proposed.

(b) Any illustration which would be helpful to understand the request.

(c) Any supporting research data which is pertinent to the item to be reviewed.

2. Interpretation—An interpretation includes application and operation of standard traffic control devices, official meanings of standard traffic control devices, or variations from standard device designs.

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

(a) A concise statement of the interpretation being sought.

(b) A description of the condition which provoked the need for an interpretation.

(c) Any illustration which would be helpful to understand the request.

(d) Any supporting research data which is pertinent to the item to be interpreted.

3. Experiment—Requests to experiment include consideration of testing or evaluating a new traffic control device, its application or manner of use, or a provision not specifically described in this Manual.

Request for permission to experiment will be considered only when submitted by the governmental agency or private toll facility responsible for the operation of the road or street on which the experiment is to take place and should contain the following:

(a) A statement indicating the nature of the problem.

(b) A description of the proposed change, how it was developed, the manner in which it deviates from the standard, and how it is expected to be an improvement over existing standards.

(c) Any illustration which would be helpful to understand the experimental device or use of the device.

(d) Any supporting data explaining how the experimental device was developed, if it has been tried, in what way it was found to be adequate or inadequate, and how this choice of device or application was derived.

(e) A detailed research or evaluation plan including the time period and location(s) of the experiment. This plan must also provide for close monitoring of the experimentation, especially in the early stages of its field implementation.

(f) An agreement to restore the experiment site to a condition which complies with the provisions of the Manual within 3 months following the end of the time period of the experiment. This agreement must also provide that the agency sponsoring the experimentation will terminate the experimentation at any time that it determines significant safety hazards are directly or indirectly attributable to the experimentation. The Office of Transportation Operations may also terminate approval of the experimentation at any time if there is an indication of hazards. If, as a result of the experimentation, a request is made that the Manual be changed to include the device or application being experimented with, the device or application may remain in place until an official rulemaking action has occurred.

(g) An agreement to provide semiannual progress reports for the duration of the experimentation and to provide a copy of the final results of the experimentation to the Office of Transportation Operations (HOTO), within 3 months following completion

of the experimentation. The Office of Transportation Operations may terminate approval of the experimentation if reports are not provided in accordance with this schedule.

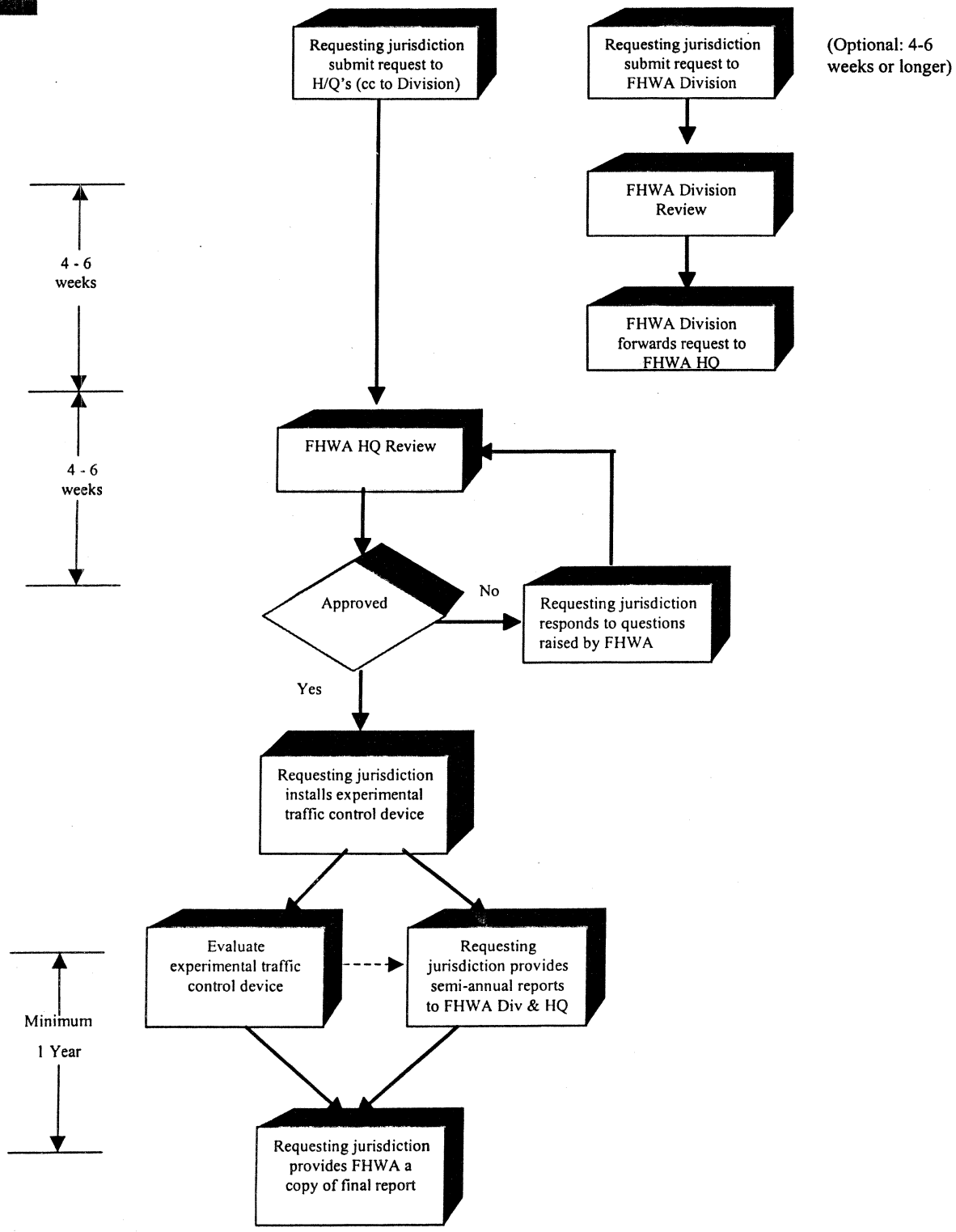
Support:

Procedures for revising the Manual are set out in the **Federal Register** of June 30, 1983, (48 FR 30145).

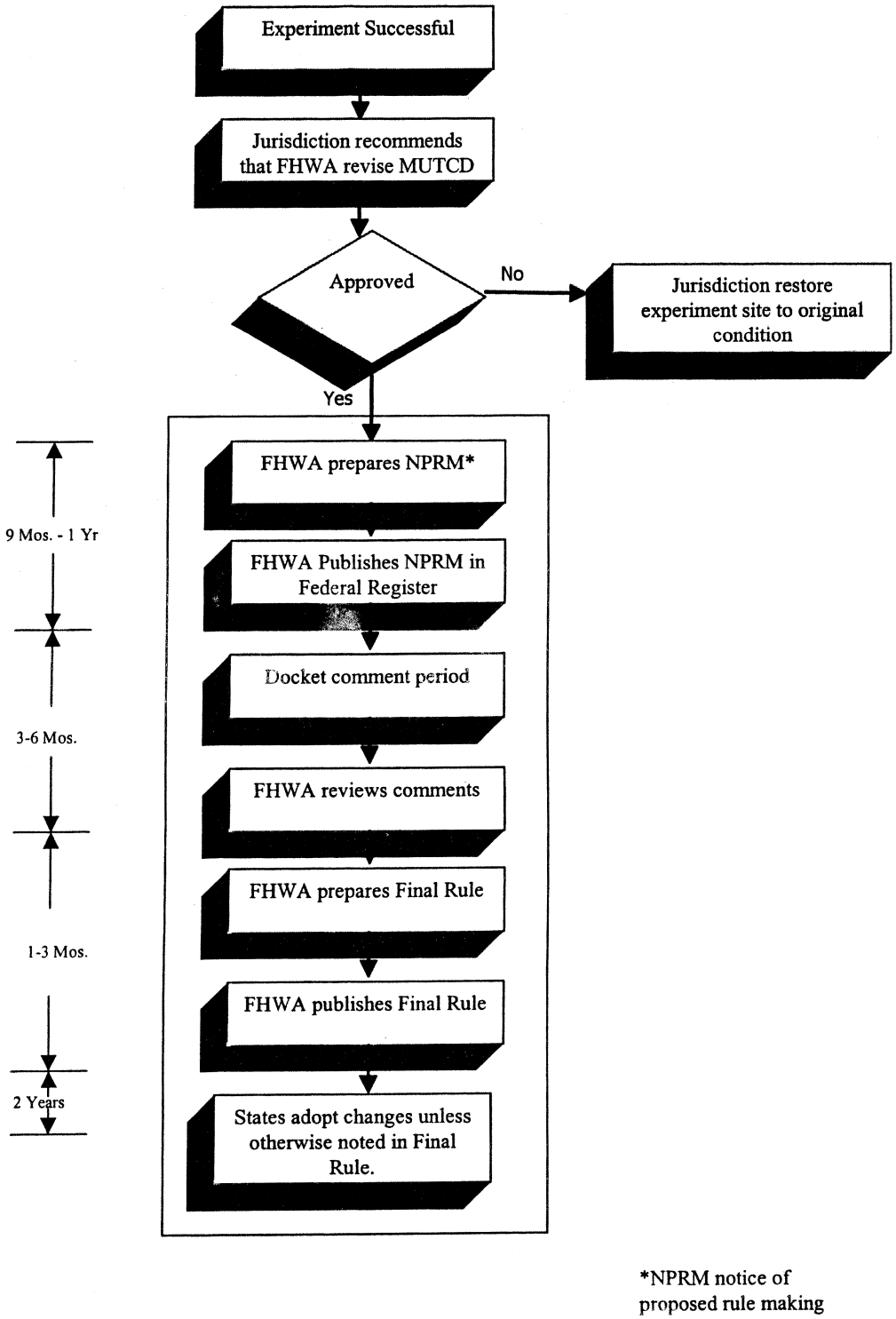
For additional copies of information concerning changes, interpretations, or experimentation, write to the FHWA (HOTO), 400 Seventh Street, SW., Washington, D.C. 20590.

BILLING CODE 4910–22–M

Obtaining Experimental Status for New Traffic Control Devices



Process to Incorporate New Traffic Control Device into MUTCD



*NPRM notice of proposed rule making

BILLING CODE 4910–22–C

1A.12 Relation to Other Documents

Support:

Two publications by the National Committee on Uniform Traffic Laws and Ordinances are specifically designed to provide the content and language of legislation needed to give regulatory devices the same meaning in all jurisdictions. These are the Uniform Vehicle Code and the Model Traffic Ordinance. Both the Code and the Ordinance require the placing of signs or other traffic control devices to make some of their provisions effective, and both define the legal meaning of certain devices. The Code directs State authorities to adopt a manual for a uniform system of traffic control devices, and requires all devices to conform thereto. The Ordinance also requires municipalities or other local governments to conform with the State manual for traffic control devices. The adoption of appropriate legislation is an essential step toward uniformity.

Standard:

To the extent they are incorporated by specific reference, the latest editions of the following documents, or those editions specifically noted, shall be a part of this Manual:

''Standard Alphabets for Highway Signs and Pavement Markings,'' FHWA

''Standard Color Tolerance Limits,'' FHWA

''Standard Highway Signs,'' FHWA

''Vehicle Traffic Control Signal Heads,'' Institute of Transportation Engineers (ITE)

''Pedestrian Traffic Control Signal Indications,'' ITE

''Purchase Specification for Flashing and Steady Burn Warning Lights,'' ITE

''Traffic Signal Lamps,'' ITE

''Uniform Vehicle Code'' and ''Model Traffic Ordinance'', National Committee on Uniform Traffic Laws and Ordinances.

Support:

Other documents that are useful sources of information with respect to utilization of these standards include:

''Traffic Engineering Handbook'', ITE

''Highway Capacity Manual,'' Transportation Research Board (TRB)

''A Policy on Geometric Design of Highway and Streets,'' American Association of State Highway and Transportation Officials (AASHTO)

''Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways, (AASHTO)

List of Control Cities for Use in Guide Signs on Interstate Highways,'' ASSHTO

''Manual on Traffic Engineering Studies,'' ITE

''Manual of Transportation Engineering Studies,'' ITE

''Roadside Design Guide,'' AASHTO

''School Trip Safety Program Guidelines,'' ITE

''Manual of Traffic Signal Design,'' ITE

''Traffic Signal Installation and Maintenance Manual,'' ITE

''Traffic Detector Handbook,'' ITE

''Signal Manual of Recommended Practice,'' Association of American Railroads (AAR)

1A.13 Color Code

Support:

The following color code establishes general meanings for eight colors of a total of twelve colors that have been identified as being appropriate for use in conveying traffic control information. Central values and tolerance limits for each color are available from the Federal Highway Administration (HOTO), 400 Seventh Street SW., Washington, D.C. 20590.

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

Standard:

YELLOW	General warning
RED	Stop or prohibition
BLUE	Road user services guidance, Tourist information, and Civil defense evacuation route
GREEN ..	Indicated movements permitted, direction guidance
BROWNn	Recreational and cultural interest guidance
ORANGE	Temporary traffic control
BLACK ...	Regulation
WHITE ...	Regulation
FLOURESCENT YELLOW-GREEN.	Pedestrian, Bicycle, School Warning
PURPLE	Unassigned
LIGHT BLUE.	Unassigned
CORAL ...	Unassigned

1A.14 Defintiions of Words and Phrases

Standard:

All words and phrases uses in this Manual shall have the meaning described herein. Unless otherwise defined herein, or in the other parts of this Manual, definitions contained in the most recent edition of the Uniform Vehicle Code, AASHTO Transportation Glossary (Highway Definitions), and other documents specified in Section 1A.12 are also incorporated and adopted by reference.

When definitions vary from UVC and AASHTO Glossary, the MUTCD definition shall be followed. Definitions included in this section are for items that are used throughout the MUTCD. If a term is used only in one specific part of the Manual (i.e., Signals), then the definition will appear in that specific part of the Manual.

85th percentile speed.—The speed at or below which eighty-five percent of the motorized vehicles travel.

Active highway-rail grade crossing warning system.—The flashing signals, with or without traffic gates, together with the necessary control equipment used to inform road users of the approach or presence of trains at the grade crossing.

Advisory speed.—A recommended maximum speed for all typical vehicles operating on a section of highway and based on an engineering study of the highway design and operating characteristics.

Approach.—All lanes of traffic moving towards an intersection or a mid-block location from one direction, including any adjacent parking lane(s).

Arterial highway (street).—A general term denoting a highway primarily use by through traffic, usually on a continuous route or a highway designated as part of an arterial highway system.

Average day.—A day representing traffic volumes normally and repeatedly found at a location, typically a weekdays when volumes are influenced by employment or a weekend day when volumes are influenced by entertainment or recreation.

Average speed.—The summation of the distances traveled divided by the summation of the time in motion to traverse the distances for all vehicles. Also may be the summation of the measured speeds of vehicles divided by the number of vehicles observed.

Bicycle.—A pedal-powered vehicle upon which the human operator sits.

Bicycle path.—A separate trail or path from which motor vehicles are prohibited and which is for the

exclusive use of bicycles or the shared use of bicycles and pedestrians. Where such trail or path forms a part of a highway, it is separated from the roadways for motor vehicle traffic by an open space or barrier.

Bicycle route.—A system of bikeways designated by appropriate route makers, and by the jurisdiction having authority.

Bikeway.—Any road, street, path, or way which in some manner is specifically designated as being open to bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.

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

Changeable message sign.—A sign with the flexibility to display various messages.

Channelizing line markings.—White pavement marking lines that define the neutral area, direct existing traffic at the proper angle for smooth divergence into the ramp, and reduce the probability of collision with objects adjacent to the roadway.

Collector highway.—A term denoting a highway which in rural areas connects small towns and local highways to arterial highways, and in urban areas provides land access and traffic circulation within residential, commercial and business areas and connects local highways to the arterial highways.

Crosswalk.—(a) That part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or in the absence of curbs, from the edges of the traversable roadway, and in the absence of a sidewalk on one side of the roadway, the part of a roadway included within the extension of the lateral lines of the sidewalk at right angles to the centerline.

(b) Any portion of a roadway at an intersection or elsewhere distinctly indicated for pedestrian crossing by lines or other markings on the surface.

Crosswalk lines.—White pavement marking lines that mark both edges of a crosswalk.

Design speed.—A speed determined by the design and correlation of the physical features of a highway that influence vehicle operation.

Edge line markings.—White or yellow pavement marking lines that delineates the right or left edge(s) of a travel way.

End of roadway marker.—A device used to warn and alert road users of the end of a roadway in other than construction or maintenance areas.

Engineering judgment.—The evaluation of available pertinent information, and the application of appropriate principles, standards, guidance, and practice as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. Engineering judgment shall be exercised by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. Documentation of engineering judgment is not required.

Engineering study.—The comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, standards, guidance, and practice as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. An engineering study shall be performed by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. An engineering study shall be documented.

Flashing (flashing mode).—A mode of operation in which a traffic signal indication is turned on and off repetitively.

Flashing beacon.—A highway traffic signal with one or more signal sections that operates in a flashing mode.

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

Highway-rail grade crossing (roadway-rail intersection).—The general area where a highway and a railroad cross at the same level, within which are included the railroad, roadway and roadside facilities for traffic traversing that area.

Highway, road, or street.—General terms denoting a public way for purposes of travel, including the entire area within the right-of-way.

Highway traffic signal.—A power-operated traffic control device by which traffic is warned or directed to take some specific action. These devices do not include power-operated signs, barricade warning lights, or steady burning electric lamps.

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

(b) If a highway includes two roadways 9 meters (30 ft) or more apart, then every crossing of each roadway of such divided highway by an intersecting highway shall be regarded as a separate intersection. If the intersecting highway also includes two roadways 9 meters (30 ft) or more apart, then every crossing of two roadways of such highways shall be regarded as a separate intersection.

(c) The junction of an alley or driveway with a roadway or highway shall not constitute an intersection

Island.—A defined area between traffic lanes for control of vehicular movements or for pedestrian refuge. Within an intersection area, a median or an outer separation is considered to be an island.

Lane line markings.—The white pavement marking lines(s) that delineate the separation of traffic lanes that have the same direction of travel on a roadway.

Lane-use control signal.—An overhead signal face displaying indications to permit or prohibit the use of specific lanes of a roadway or to indicate the impending prohibition of such use.

Major roadway.—The roadway normally carrying the higher volume of vehicular traffic.

Median.—Area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width may be different between intersections, and at opposite approaches of the same intersection.

Minor roadway.—The roadway normally carrying the lower volume of vehicular traffic.

Roadway network.—A geographical arrangement of intersecting roadways.

Object markers.—Devices used to mark obstructions within or adjacent to the roadway.

Operating speed.—A speed at which a typical vehicle or the overall traffic operates. May be defined with speed values such as the average, pace, or 85th percentile speeds.

Pace speed.—The highest speed within a specific range of speeds which represents more vehicles than in any other like range of speed. The range of speeds typically used is 10 mph.

Paved.—A bituminous surface treatment, mixed bituminous concrete, or portland cement concrete roadway surface which has both a structural (weight bearing) and a sealing purpose for the roadway.

Pedestrian.—A person afoot, in a wheelchair, on skates, or on a skateboard.

Platoon.—A group of vehicles or pedestrians traveling together as a group, either voluntarily or involuntarily, because of traffic signal controls, geometrics, or other factors.

Posted speed.—A speed limit displayed on a traffic control device.

Preferential bicycle lane.—A portion of a roadway or shoulder which has been designated for use by bicyclists. It is distinguished from the portion of the roadway for motor vehicle traffic by a paint stripe, curb, or other similar device.

Preferential lane marking.—Consists of white lines formed in a diamond shape.

Pretimed operation.—A type of controller unit operation during which the length of various intervals remains constant.

Raised pavement marker.—A device with a height of at least 10 mm (0.4 inch), mounted on or in a road surface and intended to supplement or substitute for pavement markings.

Regulatory signs.—A sign that gives notice of traffic laws or regulations.

Resistance gate (second gate).—A type of traffic gate located downstream of the moveable bridge warning gate which may provide a physical barrier to vehicle and/or pedestrian traffic when placed in the appropriate position. Additional information is contained in the AASHTO Standard Specifications for Moveable Highway Bridges.

Retroreflectivity.—The return of a point source illumination from a surface to its origin.

Right-of-way [assignment].—Permitting vehicles and/or pedestrians to proceed in a lawful manner in preference to other vehicles or pedestrians by the display of signal indications.

Road (see roadway).

Road delineators.—Retroreflective devices mounted above the roadway surface and at the side of the roadway in a series to indicate the alignment of the roadway.

Road user.—A vehicle operator, bicyclist, or pedestrian within the highway.

Roadway.—That portion of a highway improved, designed, or ordinarily used for vehicular travel, exclusive of the sidewalk, berm, or shoulder even though such sidewalk, berm or shoulder is used by persons riding bicycles or other human-powered vehicles. In the event a highway includes two or more separate roadways, the term ''roadway'' as used herein shall refer to any such ''roadway'' separately but not to all such roadways collectively. Roadway includes parking lanes.

Roadway-rail intersection (see highway-rail grade crossing.

Rural.—A type of roadway defined by the jurisdiction in compliance with their legislation, statute, regulations, and policies.

Second gate (see resistance gate).

Semi-actuated operation.—A type of operation of a controller unit in which one or more, but not all, signal phases do not function on basis of actuation.

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

Sidewalk.—That portion of a street between the curb line, or the lateral line of a roadway, and the adjacent property line, intended for use by pedestrians.

Sign illumination.—Either internal or external lighting that shows the same color day or night. Street, highway, or strobe lighting shall not be considered as meeting this definition.

Sign legend.—All word messages, borders, logos, and symbol designs that are intended to convey specific meanings.

Signal face.—Front part of a signal head.

Signal head.—An assembly of one or more signal faces together with the associated signal housings.

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

Signal indication.—The illumination of a signal lens or equivalent device or a combination of several lenses or equivalent devices at the same time.

Signal installation.—The traffic signal equipment, signal heads and their supports, and associated electrical circuitry at a particular location.

Speed.—The 85th percentile, design, average, operating, posted or statutory speed as defined by the road authority for the engineering application.

Speed limit.—The maximum (or minimum) speed applicable to a section of highway as established by law.

Speed measurement marking.—A white transverse pavement marking placed on the roadway to assist the enforcement of speed regulations.

Speed zone.—A section of highway with a speed limit which is established by law but which is different form a legislatively specified statutory speed limit. Often established by administrative action as permitted by law.

Statutory speed.—A speed limit established by legislative action which typically is applicable for highways with specified design, functional, jurisdictional and/or location characteristic.

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

Street (see roadway).

Traffic.—Pedestrains, ridden or herded animals, vehicles, streetcars, and other conveyances either singularly or together while using any highway for purposes of travel.

Traffic control devices.—All signs, signals, markings, islands, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, road, pedestrian facility, or bicycle path by authority of a public body or official having jurisdiction.

Traffic control signal (traffic signal).—Any highway traffic signal by which traffic is alternately assigned the right-of-way to the various movements at an intersection or other roadway location.

Train.—A locomotive or self-propelled unit which is assigned a train number, which operates on fixed rails or tracks and to which all other traffic must yield the right-of-way by law.

Transverse markings.—Pavement markings that include shoulder markings, word and symbol markings, stop liens, crosswalk lines, speed measurement markings, parking space markings, and others.

Traveled way.—The portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.

Urban.—A type of roadway as defined by the jurisdictions in compliance with their legislation, statute, regulations, and policies.

Vehicle.—Every device in, upon, or by which any person or property may be transported or drawn upon a highway, except trains. A light rail car operating on a roadway, to which other traffic is not required to yield the right-of-way by law, is vehicle.

Warning gate.—A type of traffic gate designed to warn, but not to primarily provide a physical barrier to, vehicle and/or pedestrian traffic when placed in the appropriate position.

Warning sign.—A sign that calls attention to conditions on a adjacent to a highway or street that present a situation that may not be readily apparent to the road user.

Warrant.—A warrant describes threshold conditions to the engineer in evaluating the potential safety and operational benefits of traffic control devices and is based upon ''average'' or ''normal'' conditions. Warrants are not a substitute for engineering judgment. The fact that a warrant for a particular traffic

control device is met is not conclusive justification for the installation of the device.

Wrong-way arrows.—Slender, elongated, white pavement marking arrows placed upstream from the ramp terminus to indicate the correct direction of traffic flow. They are intended primarily to warn wrong-way road users that they are going in the wrong direction.

1.A.15 Abbreviations

Standard:

The following are standard abbreviations for word messages used in connection with traffic control devices:

ON SIGNS

ALT = alternate
AM = morning
AVE = avenue
BIKE = bicycle
BLVD = boulevard
CB = CB Radio
CD = civil defense
CYCLES = 2-wheeled vehicles
D = diesel fuel
DR = drive
E = east
EV = electric vehicle
EXEMPT = stop at highway-rail grade crossing not required by some types of vehicles
FM = FM radio
FT = feet
H = hospital
HR = hour
INFO = information
JCT = junction/intersection
KM = kilometers
KM/HR = kilometers per hour
LN = lane
LBS = pounds
LP–GAS = liquid propane gas
LUGS = tires with lugs
M = meters
MIN = minutes
MI = miles
MON-FRI = days of week
M.P.H. = miles per hour
NAT'L = national
N = north
P = parking
PED = pedestrian
PHONE = telephone
PM = afternoon/night
R.R. = highway-rail grade crossing
ST = street
T = tons of weight
US = state numbered route
2-WAY = two way intersection
- = to
& = and
? = information
% = percent
'' = inches
' = feet

PAVEMENT MARKINGS

MPH = miles per hour
PED = pedestrian
RXR = highway-rail grade crossing
US = state numbered route
XING = crossings other than highway-rail grade

ON SIGNALS

DONT = do not

3B. Pavement and Curb Markings

3B.1 Yellow Longitudinal Line Markings

A. Center Line Markings

Standard:

Center line markings, when used, shall be the pavement markings used to delineate the separation of traffic lanes which have opposite directions of travel on a roadway. These markings need not be placed at the geometrical center of the roadway.

Option: On roadways without a continuous center line marking, short sections may be marked with center line to control the position of traffic at specific locations, (e.g. around curves, over hills, on approaches to roadway-rail intersections, at roadway-rail intersections and at bridges.)

Standard:

The center line markings on two-lane, two-way roadways shall be one of the following as shown in Figure 3–1:

- Broken center line markings consisting of a normal broken yellow line where crossing the centerline markings for passing with care is permitted for traffic traveling in each direction.
- One-direction no-passing zone markings consisting of a normal broken yellow line and a normal solid yellow line where crossing the center line markings for passing with care is permitted for the traffic traveling adjacent to the broken line but is prohibited for traffic traveling adjacent to the solid line.
- Two-direction no-passing zone markings consisting of two normal solid yellow lines where crossing the centerline markings for passing is prohibited for traffic traveling in each direction.

Standard:

The center line markings one two-ways roadways with four or more traffic lanes always available, shall be the two-directions no-passing zone markings as shown in Figures 3–2 and 3–3.

Guidance:

On two-way roadways with three traffic lanes, two lanes should be designated for traffic in one direction by using one- or two-direction no-passing zone markings as shown in Figure 3–4.

Standard:

Center line markings shall be placed on paved two-way traveled ways on streets and highways having one or more of the following characteristics.

(a) All urban and rural arterials and collectors that have a roadway of 6 m (20 ft) or more in width with an ADT of 6000 or greater.

(b) All urban and rural highways that have three or more traffic lanes.

Guidance:

Center line markings should be place on the paved, two-way traveled ways on streets and highways having the following characteristics:

- Urban arterials and collectors that have a roadway 6 m (20 ft) or more in width with an ADT of 4000 or greater.
- All rural arterials and collectors that have a roadway of 5.5 m (18 ft) or more in width with an ADT of 3000 or greater.

An engineering study should be used in determining whether to place center line markings on a traveled way less than 4.8 m (16 ft) wide due to traffic encroaching on the pavement edges, traffic being affected by parked vehicles, and due to traffic encroachment into the lane of opposing traffic where edge line markings are used.

Option: Center line markings may be placed on other two-way roadways 4.8 m (16 ft) or more in width.

B. No-Passing Zone markings

Standard:

A no-passing zone shall be marked by either the one direction no-passing zone markings or the two-direction no-passing zone markings described above and shown in Figures 3–1b, 3–2, 3–3, and 3–4.

When center line markings are used, the no-passing zone marking shall be used on two-way roadways at lane reduction transitions (Sections 3B.5) and on approaches to obstructions that must be passed on the right (Section 3B.6).

Guidance:

Where the distance between successive no-passing zones is less than 120 m (400 ft), no-passing markings should connect the zones.

Option: In addition to the pavement markings herein prescribed, no-passing zone signs (Section 2B.21, 2B.22, 2C.38) may be used to emphasize the existence and extent of a no-passing zone.

Support:

Specific reference is made to Section 11–307 UVC Revised.

Standard:

On two-way, two- or three-lane roadways where center line markings are installed, no-passing zones shall be established as follows:

(1) at vertical and horizontal curves and other locations where an engineering study indicates passing must be prohibited because of inadequate sight distances or there special conditions.

(2) with the no-passing zone markings extended throughout the no-passing zone.

(3) on three-lane roadways where two lanes from each direction of travel transition to become one lane for each direction of travel, a median island shall be provided in the center lane. The median island shall consist of a lane transition at each end of a buffer zone and shown in Figure 3–5.

Guidance:

For roadways having a posted or statutory speed limit of 70 KM/H (45 mph) or greater, the transition taper length should be computed by the formula L = 0.62WS (L=WS).

For roadways having a posted or statutory speed limit of 60 KM/H (40 mph) or less, the taper length should be computed by the formula $L=WS^2/155$ ($L=WS^2/60$). Under both formulas, L equals the taper length in meters (feet), W equals the width of the center lane in meters (feet), and S equals the posted or statutory speed limiting in kilometers (miles) per hours.

The minimum taper length of the lane transitions shall be 30 m (100 ft) in urban areas and 60 m (200 ft) in rural areas.

Standard:

On roadways with center line markings, a no-passing zone marking shall be used at a horizontal or vertical curve where the sight distance is less than the minimum necessary for safe passing at the posted or statutory speed limit a s shown in Table 3–1, Passing sight distance on a vertical curve is the distance at which an object 1.07 m (3.50 ft) above the pavement can be seen by an approaching driver (Figure 3–6a). Similarly, passing sight distance on a horizontal curve is the distance measured along the center line (or right hand lane line of a three-lane highway) between two points 1.07 m (3.50 ft) above the pavement on a line tangent to the embankment or other obstruction that cuts off the view on the inside of the curve (Figure 3–6b).

TABLE 3–1. MINIMUM PASSING SIGHT DISTANCES

Posted or Statutory Speed Limit		Minimum Passing Sight Distance	
km/h	mph	meters	feet
40	25	140	450
50	30	160	500
60	35	180	550
a.	40	.....	600
70	45	210	700
80	50	245	800
90	55	280	900
100	60	320	1,000
110	65	355	1,100
120	70	395	1,200

Support:

The beginning of a no-passing zone at point ''a,'' in Figure 3–6 is that point where the sight distance first becomes less than that specified in Table 3–1. The end of the no-passing zone at point ''b'' in Figure 3–6 that point at which the sight distance again becomes greater than the minimum specified.

C. Reversible Lane Line Markings

Standard:

The reversible lane line markings shall consist of two normal broken double yellow lines to delineate the edges of a lane in which the direction of travel is changed from time to time in such a way that these markings serve as the center line markings of the roadway during some period. Signs, signals, or both shall be used to supplement these pavement markings as shown in Figure 3–7.

D. Two-Way Left Turn Lane Markings

Standard:

The two-way left turn lane markings shall consist of a normal broken yellow line and a normal solid yellow line to delineate both edges of a two-way left turn lane which may be used by traffic for part of a left turn maneuver. These markings shall be placed with the broken line toward the two-way left turn lane and the solid line toward the adjacent traffic lane as show in Figure 3–3a. Traffic adjacent to the solid line may cross such markings with care only as part of a left turn maneuver.

Option: Pavement marking arrows may be used in conjunction with the two-way left turn markings as shown in Figure 3–3a.

Guidance:

Signs should be used in conjunction with the two-way left turn markings (Section 2B.19).

E. Median Islands Formed by Pavement Markings

Standard:

Two double solid yellow lines shall be used to form continuous median islands where these islands separate travel in opposite directions as shown in Figures 3–2b and 3–5. Other markings in the median island area shall be yellow, except crosswalk markings which shall be white (Section 3B.8).

F. Left Edge Line Markings

Standard:

The left edge line markings shall consist of a normal solid yellow line to delineate the left edge of a roadway, or to indicate driving or passing restrictions left of these markings on the roadways of divided and one-way highways and on any ramp in the direction of travel (Section 3B.3).

3B.2 White Longitudinal Line Markings

A. Lane Line Markings

Standard:

Lane line markings when used, shall be the pavement markings used to delineate the separation of traffic lanes that have the same direction of travel.

Support:

Typical applications of lane line markings are shown in Figures 3–1 through 3–6, 3–8 through 3–13, 3–20, and 3–21.

Standard:

The broken white lane line markings shall consist of a normal broken white line where crossing the lane line markings with care is permitted.

Standard:

The solid lane line markings shall consist of a normal solid white line where crossing the lane line markings is discouraged.

Option: Solid white lane line markings may be used to separate through traffic lanes from auxiliary lanes, such as uphill truck lanes, left or right turn lanes and preferential lanes. They may also be used to separate traffic lanes approaching an intersection. Wide solid lane line markings may be used for greater emphasis.

Standard:

Double solid lane markings shall consist of two normal solid white lines where crossing the lane line markings is prohibited.

Standard:

Lane line markings shall be used on all Interstate highways and freeways.

Guidance:

Lane line markings should be used at the following locations:

(a) on all roadways with 2 or more adjacent traffic lanes that have the same direction of travel,

(b) at congested locations where the roadway will accommodate more traffic lanes with lane line markings than without the markings.

Standard:

The channelizing line shall be a wide or double solid white line. Other markings in the island area shall be a normal solid white line.

Option: The channelizing line may be used to form islands where traffic with the same direction of travel is permitted on both sides of the island.

Support:

Typical examples of channelizing line applications are shown in Figures 3–2, 3–3, 3–8, 3–9, 3–11, 3–12, 3–13c, and 3–20.

C. Interchange Ramp Markings

Support:

Channelizing lines at exit ramps as shown in Figure 3–11, define the neutral area, direct existing traffic at the proper angle for smooth divergence into the ramp, and reduce the probability of colliding with objects adjacent to the roadway.

Channelizing lines at entrance ramps as shown in Figure 3–12, promote safe and efficient merging with the through traffic.

Standard:

For exit ramps, channelizing lines shall be placed along the sides of the neutral area adjacent to the through traffic lane and the ramp lane. With a parallel deceleration lane, a lane line shall be extended from the beginning of the channelizing line upstream for a distance of one-half the length of the full-width deceleration lane.

Option: White transverse markings may be placed in neutral area for special emphasis, as shown in Figures 3–11a,b, and 3–12c.

Guidance:

For entrance ramps, a channelizing line should be placed along the side of the neutral area adjacent to the ramp lane.

On entrance ramps with a parallel acceleration lane, or lane line should be extended from the end of the channelizing line for a distance one-half the length of the full width acceleration lane, as should in Figure 3–12a.

Option: With a tapered acceleration lane, lane line markings may be placed to extend the channelizing line, but not beyond a point where the tapered lane meets the near side of the through traffic lane, as shown in Figure 3–12b.

Lane drop markings as shown in Figure 3–11c may be used in advance of lane drops at exit ramps to distinguish a lane drop from a normal exit ramp or from an auxiliary lane. The lane drop marking may consist of a wide, white dotted line with segments 900 mm (3ft) in length separated by 3.6 m (12ft) gaps.

Guidance:

If used, lane drop markings should begin 800 m (0.5 mi) in advance of the theoretical gore point.

Option: Where lane changes might cause conflicts, a wide solid white channelizing line may extend upstream from the theoretical gore point.

Support:

Pavement marking arrow use for wrong-way traffic is included in Section 3B.12.

D. Right Edge Line Markings

Standard:

The right edge line markings shall consist of a normal solid white line to delineate the right edge of the roadway (Section 3B.3).

3B.3 Edge Line Markings

Standard:

Edge line markings are those markings which delineate the right or left edges of a roadway (Sections 3B.1 and 3B.2).

Edge line markings shall not be continued through intersections.

Guidance:

Edge line markings should not be broken for driveways.

Support:

Edge line markings have unique value as visual references to guide road users during adverse weather and visibility conditions.

Edge Line Marking Warrants

Standard:

Edge line markings shall be placed on the paved traveled ways on streets and highways with the following characteristics:

- freeways
- expressways
- rural arterials with a roadway 6 m (20 ft) or more in width with and ADT of 6000 or greater.

Guidance:

Edge line markings should be placed on the paved roadways of the following highways:

- Rural collectors with a roadway 6 m (20 ft) or more in width and where the edge of the roadway is not otherwise delineated with curbs or other pavement markings such as for parking.
- Other paved streets and highways where an engineering study indicates a need.

Option: Edge line markings may be placed on highways with or without center line markings. They may be excluded based on engineering judgment where the traveled way edge are delineated by curbs or other markings. Edge line markings may be used where edge delineation is desirable to minimize unnecessary driving on paved shoulders or on refuge areas that have lesser structural pavement strength than the adjacent roadway.

3B.4 Extensions Through Intersections or Interchanges

Standard:

Pavement markings extended into or continued through an intersection or interchange area shall be the same color and at least the same width as the line markings they extend.

Guidance:

Where highway design or reduced visibility conditions make it desirable to provide control or to guide vehicles through an intersection or interchange such as at offset, skewed, complex multi-legged intersections, or where multiple turn lanes are used, dotted line markings should be used to extend longitudinal line markings as necessary through an intersection or interchange area (Figures 3–9, 3–9a, 3–11 & 3–20).

Where greater restriction is required, solid lane lines or channelizing lines should be extended into or continued through intersections.

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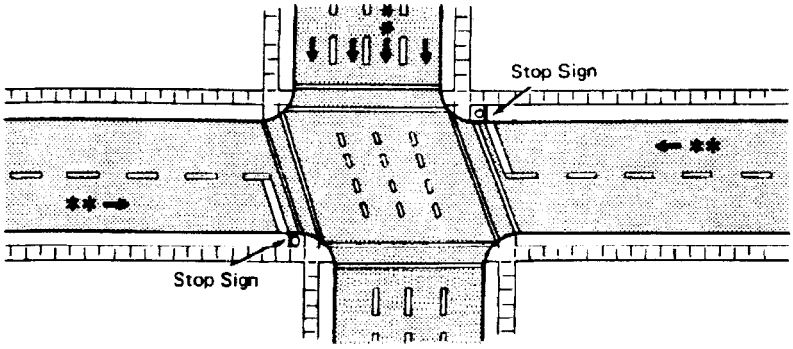
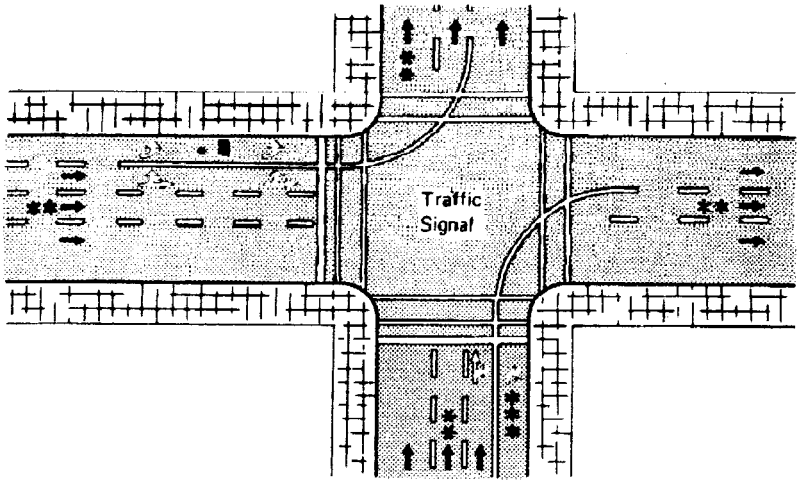
a—Typical pavement marking with offset lane lines continued through the intersection and optional crosswalk lines and stop limit lines.



b—Typical pavement marking with optional double turn lane lines, lane-use turn arrows, crosswalk lines, and stop limit lines.



c—Typical pavement marking with optional turn lane lines, lane use turn arrows, crosswalk lines, and stop limit lines.

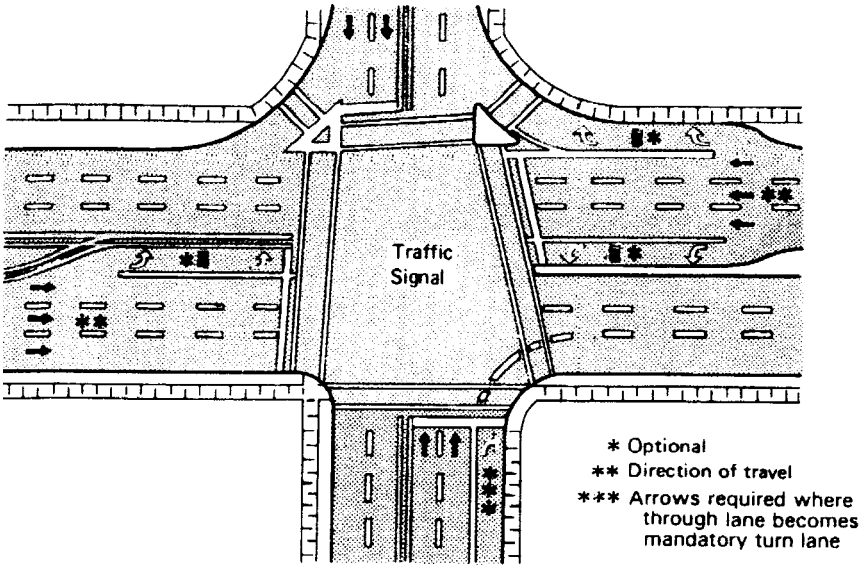
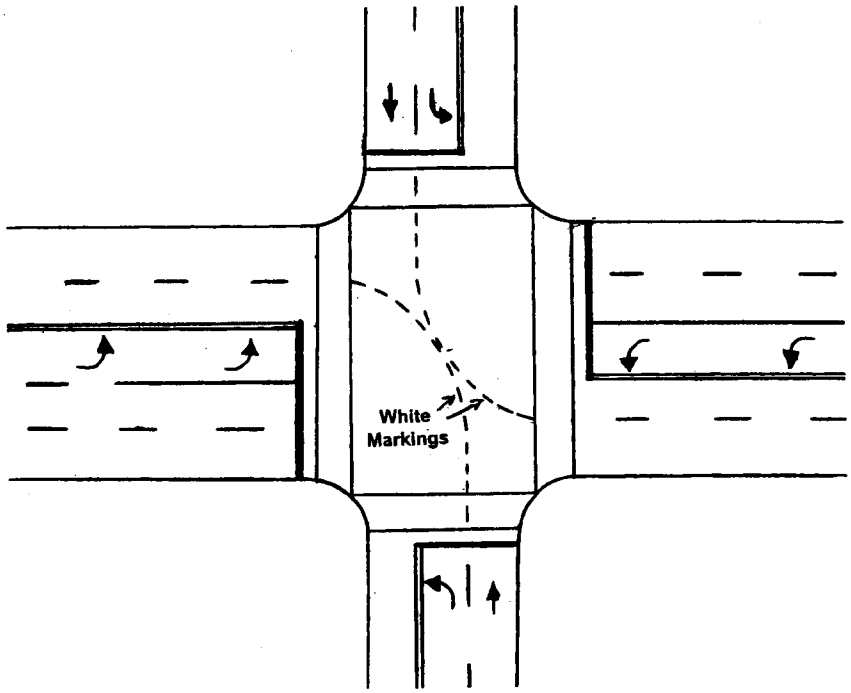


Figure 3-9. Typical pavement marking applications.

d - Typical dotted line markings to extend longitudinal lane line markings.



e - Typical dotted line markings to extend longitudinal center line markings.

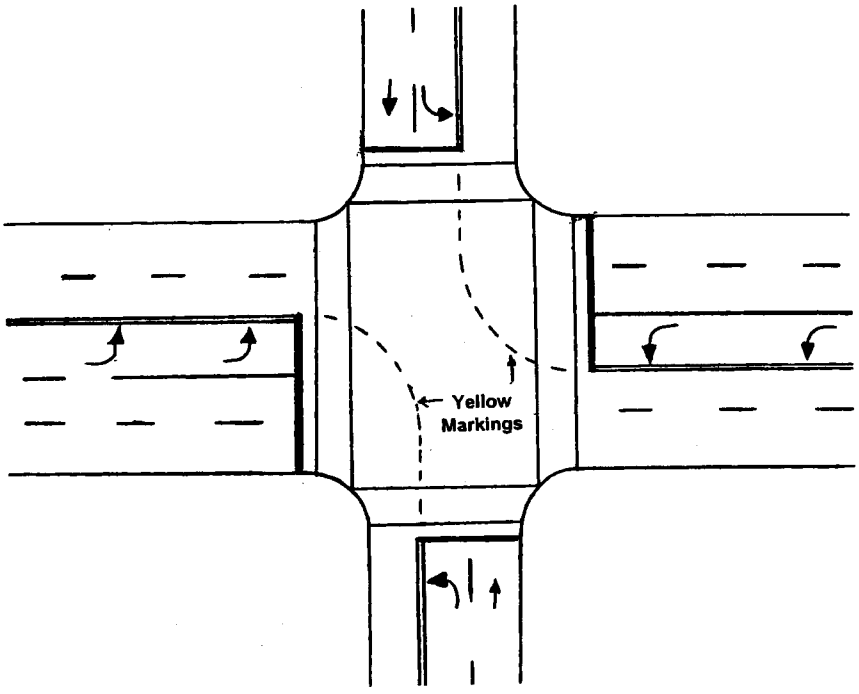


Figure 3-9a. Typical pavement marking applications.

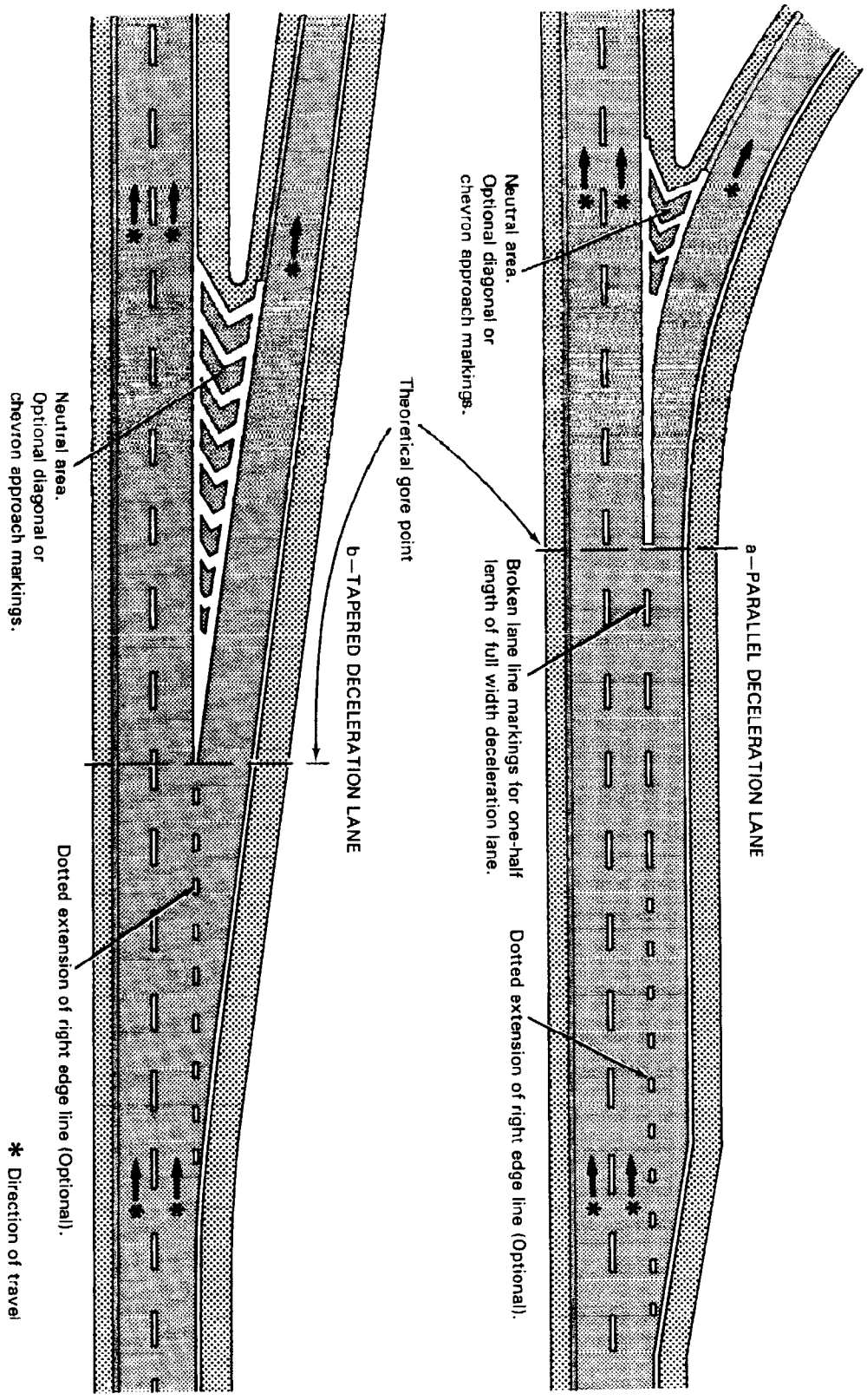


Figure 3-11. Typical exit ramp markings.

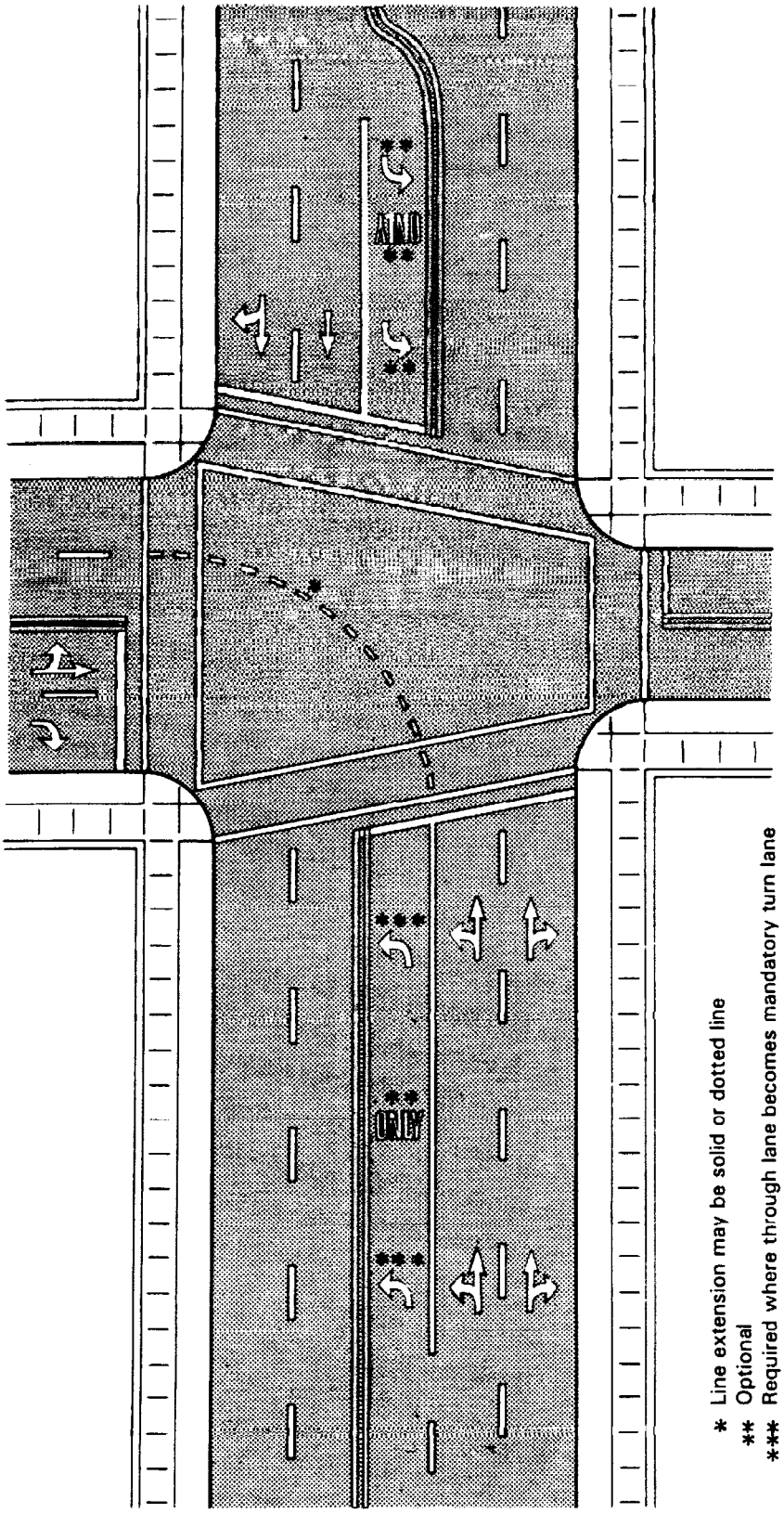
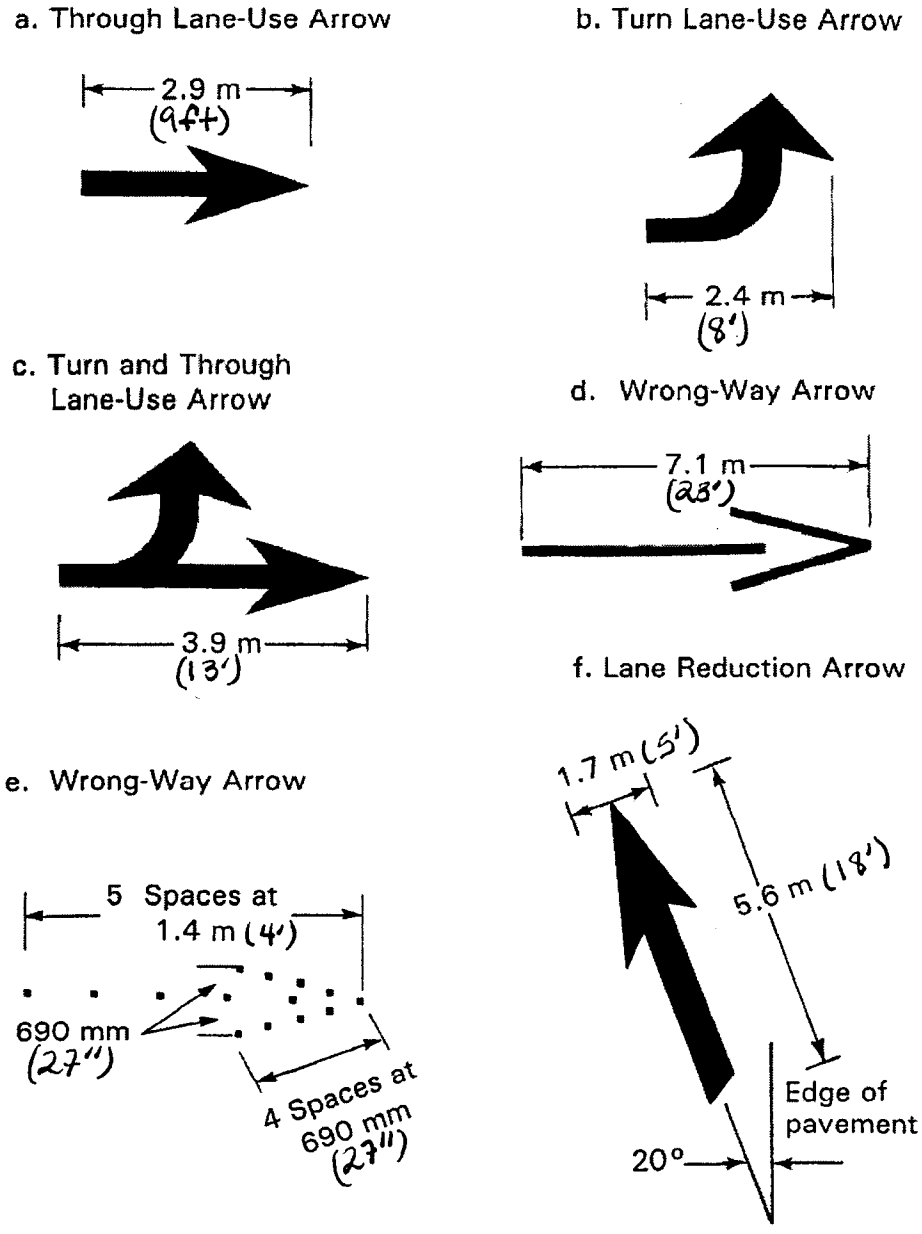


Figure 3-20. Typical lane-use-control word and symbol markings.



Standard sizes for normal installation; smaller sizes may be reduced approximately one-third for low speed urban conditions; larger sizes may be needed for freeways, above average speeds, and other critical locations. A narrow elongated arrow design is optional. For proper proportion, see Standard Alphabets for Highway Signs and Pavement Markings (Available from FHWA, HHS-10, Washington, DC. 20590)

Figure 3-19. Lane-Use, Lane Reduction and Wrong-Way Arrows for Pavement Markings.

3B.9 Stop and Yield Lines

Standard:

Stop lines are solid white lines extending across approach lanes to indicate the point at which the stop is intended or required to be made.

Yield lines consist of a row of isosceles triangles extending across approach lanes, and pointing toward approaching vehicles to indicate the point at which the yield is intended or required to be made.

Guidance:

Stop lines should be 300 to 600 mm (12 to 24 in) wide.

Stop lines should be used to indicate the point behind which vehicles are required to stop, in compliance with a STOP sign or traffic signal.

The individual triangles comprising the yield line should have a base of 0.3 to 0.6 m (12 to 24 in) wide and a height equal to 11/2 times the base. The space between the triangles should be 75 to 300 mm (3 to 12 in). (See Figure 3–24)

Option: Yield lines may be used to indicate the point behind which vehicles are required to yield in compliance with a YIELD sign.

Guidance:

Stop and yield lines, where used, should be placed 1.2 m (4 ft) in advance of and parallel to the nearest crosswalk line, except at roundabouts as provided for in Section 3B.17.

In the absence of a marked crosswalk, the stop line or yield line should be placed at the desired stopping or yielding point, but should be placed no more than 9.0 m (30 ft) nor less than 1.2 m (4 ft) from the nearest edge of the intersecting traveled way. Stop lines should be placed to ensure sufficient sight distance for all approaches to an intersection.

Stop lines at mid-block signalized locations should be placed at least 12.0 m (40 ft) in advance of the nearest signal indication. (See Section 4B.15)

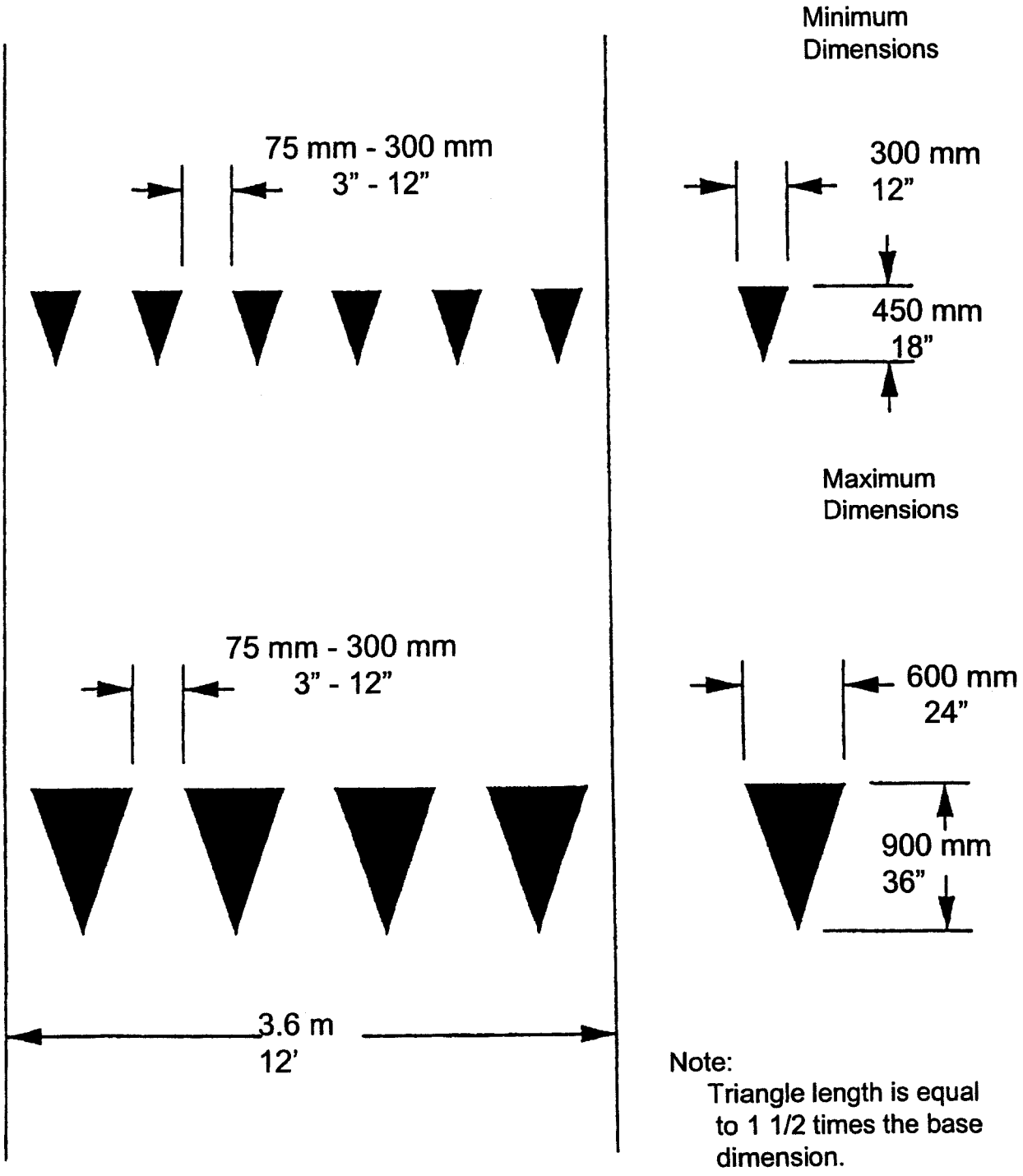


Figure 3-24. Typical Yield Line Layout

3B.12 Pavement Word and Symbol Markings

Support:

Word and symbol markings on the pavement are used for the purpose of guiding, warning, or regulating traffic. Symbol messages are preferable to word messages. Examples of standard symbol, word, and arrow pavement markings are shown in Figures 3–18 and 3–19.

Standard:

Word and symbol markings should be white.

Guidance:

Large letters and numerals should be 1.8 m (6 ft) or more in height.

Word and symbol markings should not exceed three lines of information.

If a pavement marking word message consists of more than one word, it should read in the direction of travel. The first word should be nearest to the road user.

The longitudinal space between words or symbol message markings, including arrow markings, should be at least four times the height of the characters for low speed roads but not more than ten times the height of the characters under any conditions.

The number of different word and symbol markings used should be minimized to provide effective guidance and avoid misunderstanding.

Pavement word and symbol markings should be no more than one lane in width except ''SCHOOL'' word markings.

Option: The ''SCHOOL'' word markings may extend to the width of two lanes. (Section 7C.6).

Guidance:

When the ''SCHOOL'' word markings are extended to the width of two lanes, the characters should be 3 m (10 ft) or more in height. (Section 7C.6).

Option: The International Symbol of Access (ISA) parking space markings may be placed in each parking space designated for use by persons with disabilities. A blue background with a white border may supplement the wheelchair symbol as shown in Figure 3–17.

Standard:

Where a through lane becomes a mandatory turn lane, lane-use arrow markings shown in Figure 3–19 shall be used and accompanied by standard signs.

The standard designs of lane use, lane reduction, and wrong way arrow markings are shown and discussed in Figure 3–19.

Guidance:

Where a through lane becomes a mandatory turn lane, signs or markings should be repeated as necessary to prevent entrapment and to help the road user select the appropriate lane in advance of reaching a queue of waiting vehicles.

Option: Lane-use arrow markings in Figure 3–19 may be used to convey either guidance or mandatory messages.

The message marking ''ONLY'' may be used to supplement lane-use arrow markings (Figures 3–18 and 3–20).

In situations where a lane reduction transition occurs, the lane reduction arrow markings in Figure 3–19 may be used.

The wrong-way arrow markings in Figure 3–19 may be placed near the downstream terminus of a ramp as shown in Figures 3–12(a) and 3–21(b). This arrow indicates the correct direction of traffic flow to warn of travel in the wrong direction.

A yield-ahead triangle symbol or ''YIELD AHEAD'' word pavement markings may only be used in advance of intersections where approaching traffic will encounter a YIELD sign. (See Figure 3–25).

Support:

Lane-use arrow markings are often used to provide guidance in turn bays (Figure 3–20) where turns may or may not be mandatory and in two-way left-turn lanes (Figure 3–3(a)).

Where crossroad channelization or ramp geometry do not make wrong-way movements physically difficult, guidance to a potential wrong-way road user can be provided by placing a lane-use arrow marking in each lane of the ramp near the crossroad where it is clearly visible.

Option: word and symbol markings may include, but are not limited to, the following: Other words or symbols may also be used under certain conditions.

a. Regulatory
STOP
RIGHT (LEFT) TURN ONLY
40 KM/H (25 MPH)
Arrow Symbols

b. Warning
STOP AHEAD
YIELD AHEAD
YIELD AHEAD Triangle Symbol
SCHOOL X-ING
SINGAL AHEAD
PED X-ING
SCHOOL
R X R

c. Guide
US 40
STATE 135
ROUTE 40

Standard:

The word ''STOP'' shall not be used on the pavement unless accompanied by a stop line (Section 3B.9) and STOP sign (Section 2B.4).

The word ''STOP'' shall not be placed on the pavement in advance of a stop line, unless every vehicle is required to stop at all times.

The yield-ahead triangle symbol or ''YIELD AHEAD'' word pavement marking shall not be used unless a YIELD sign (Section 2B.7) is in place at the intersection. The yield-ahead symbol marking shall be as shown in Figure 3–25.

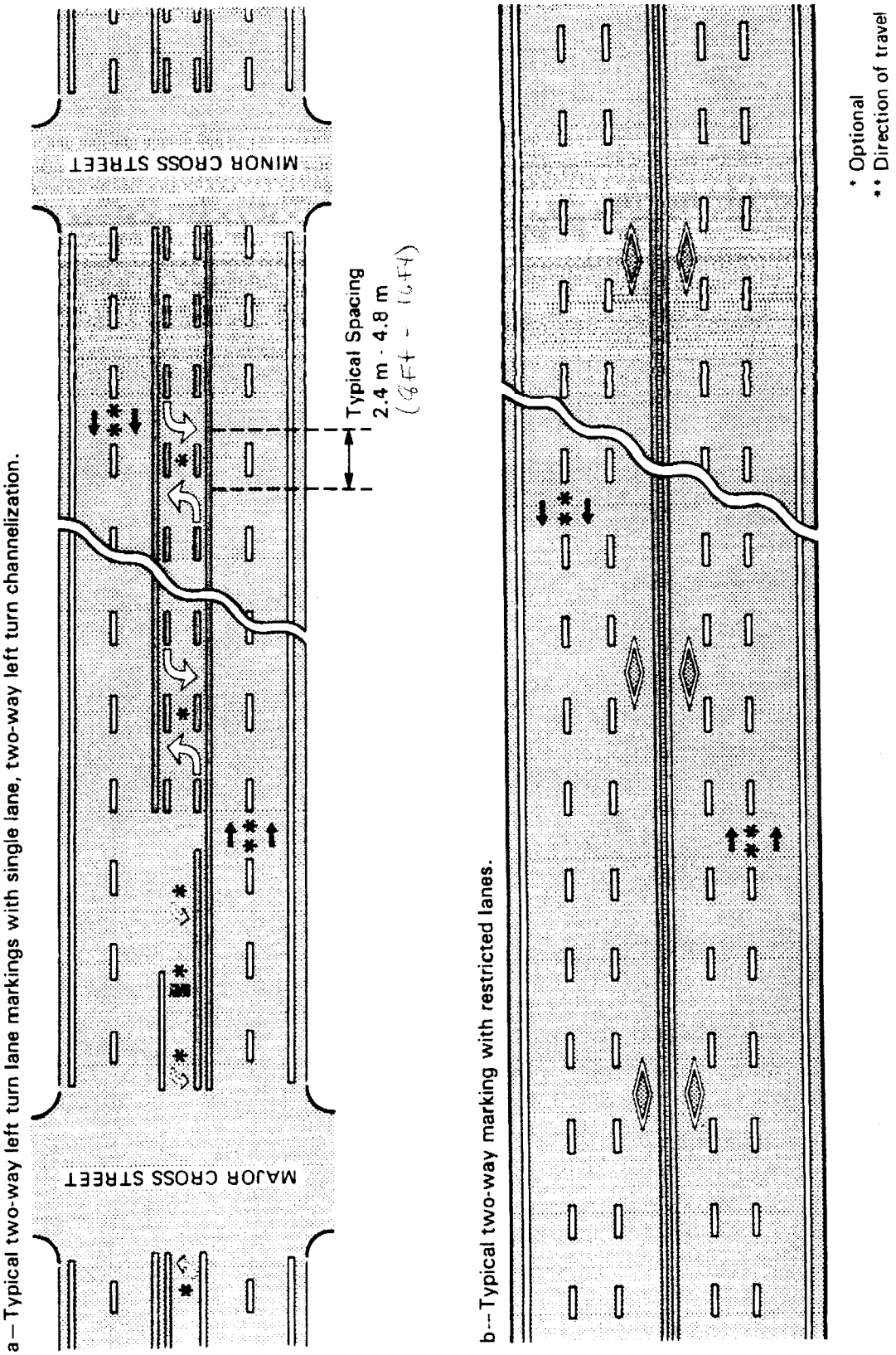


Figure 3-3. Typical two-way marking applications.

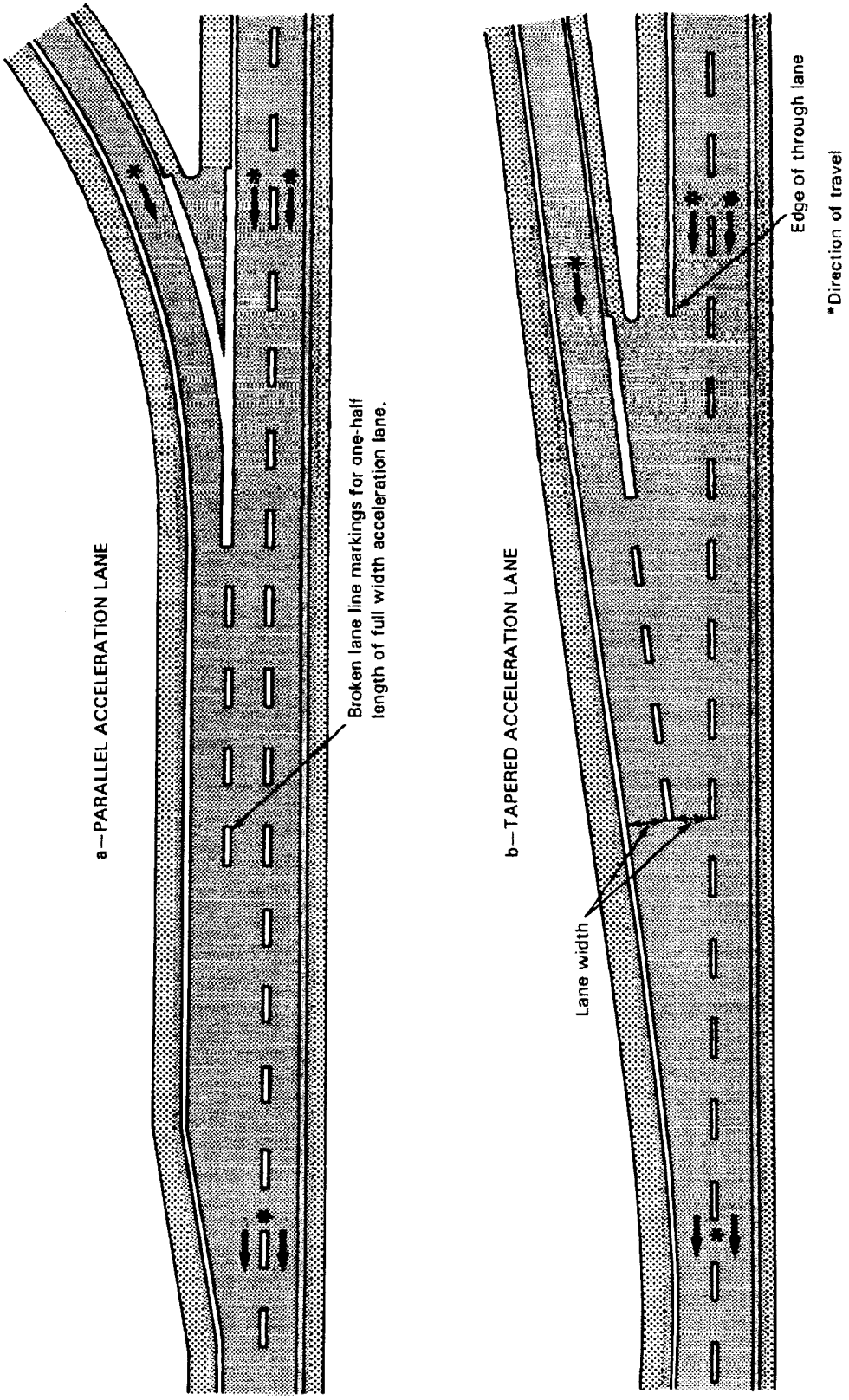


Figure 3-12. Typical entrance ramp markings.

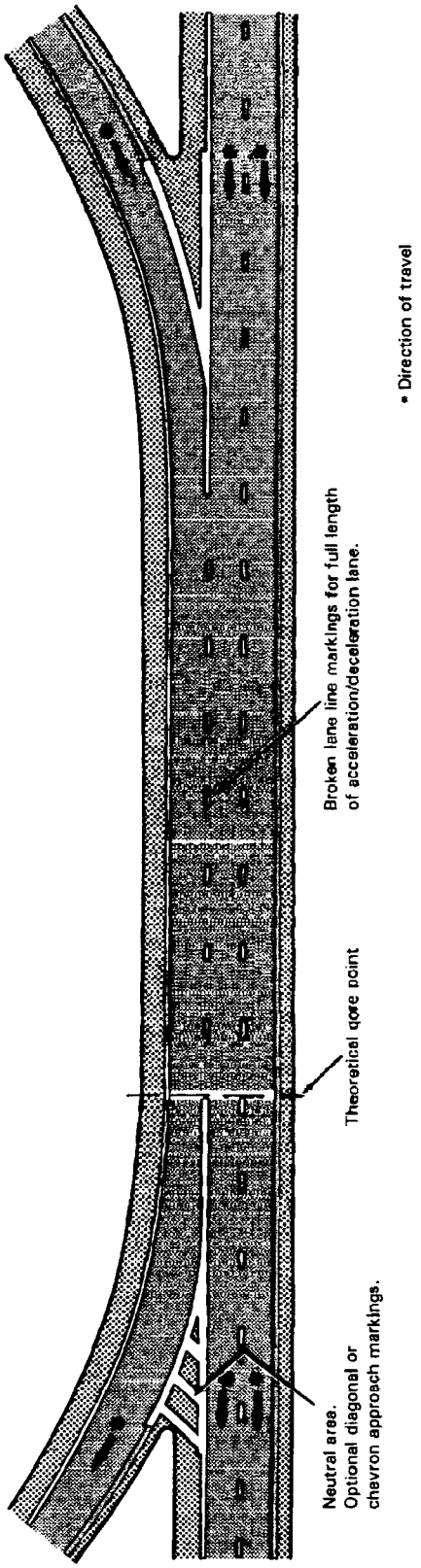


Figure 3-12c. Typical cloverleaf loop ramp markings.

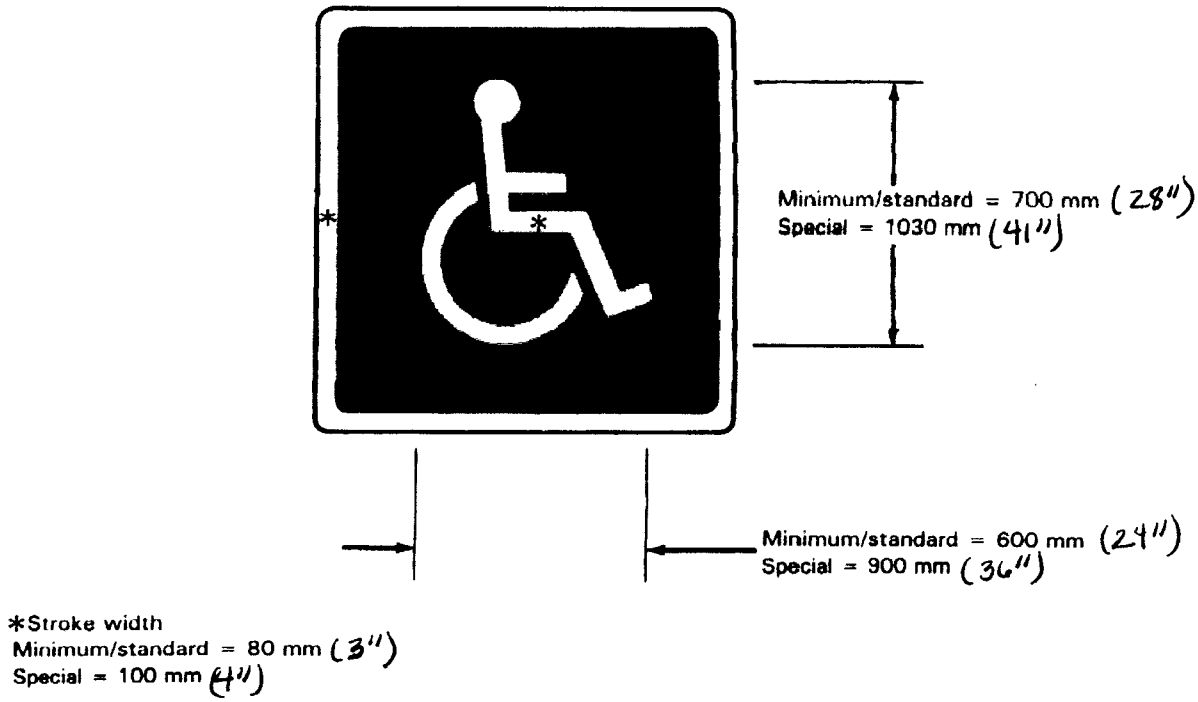


Figure 3-17. International symbol of access parking space marking with blue background and white border otions.

Figure 3-18. Typical elongated letters for pavement marking.

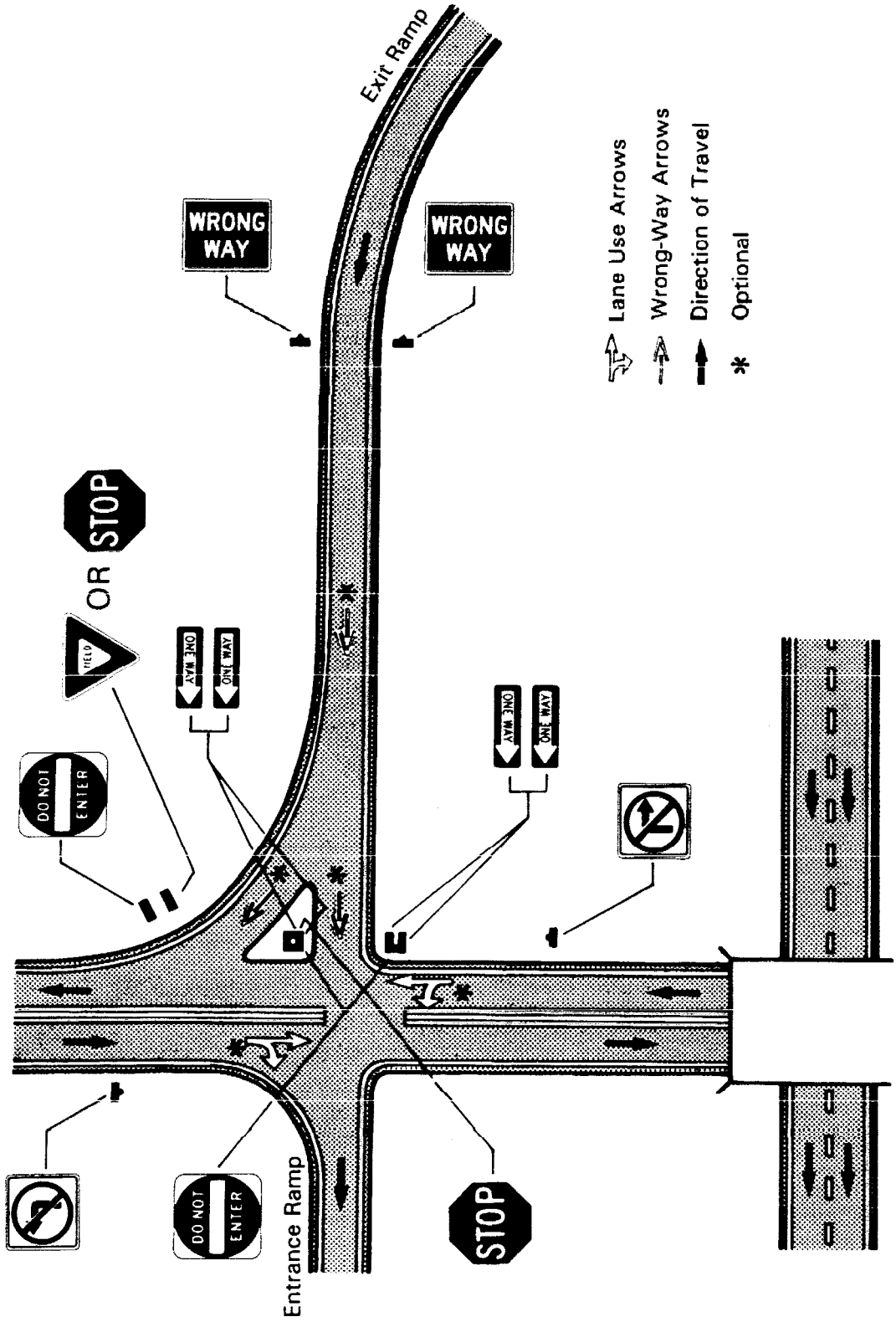


Figure 3-21a. Arrow markings at exit ramp terminals to deter wrong-way entry (Modify as appropriate for 4-lane crossroads).

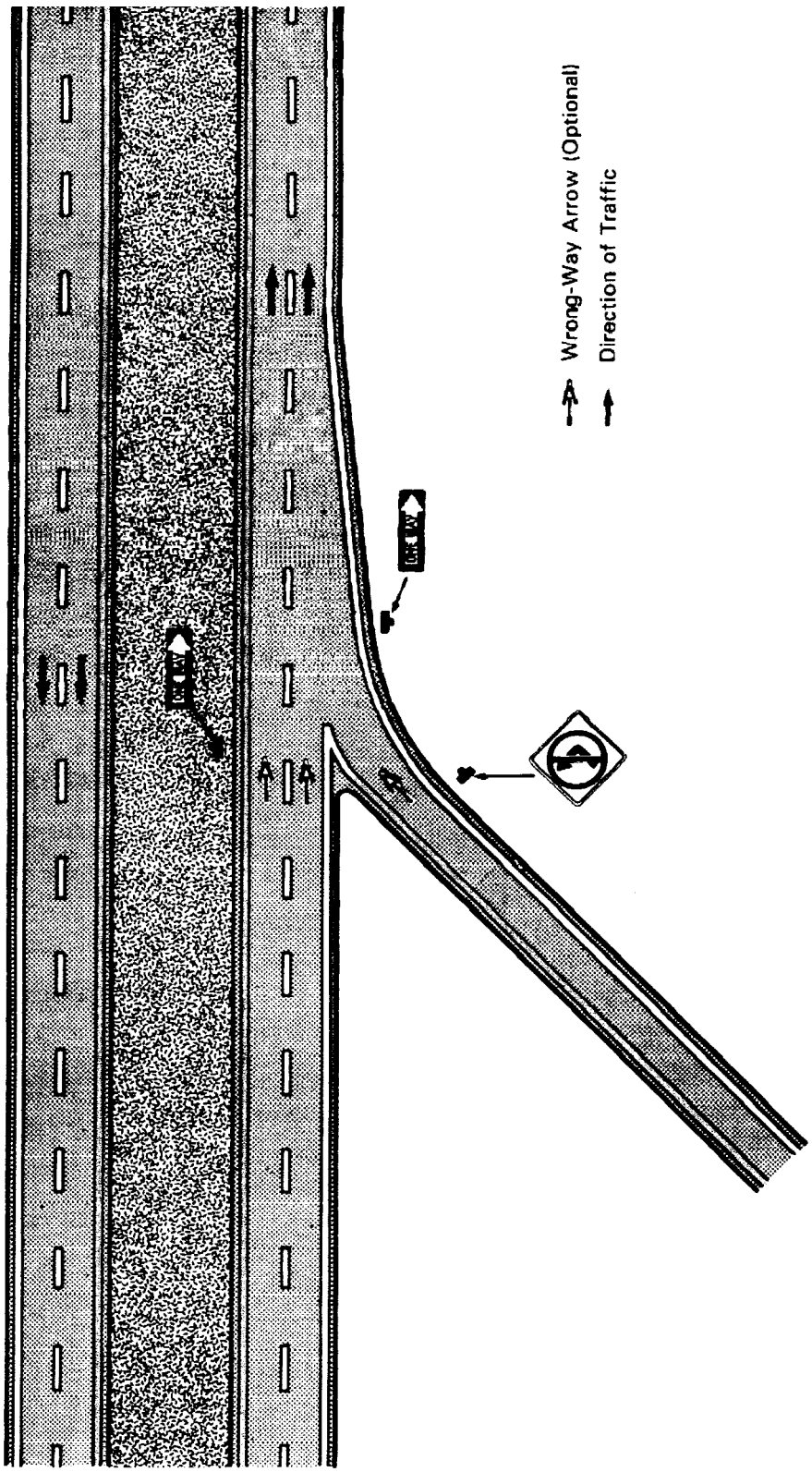


Figure 3-21b. Arrow markings at entrance ramp terminals where design does not clearly indicate the direction of flow.

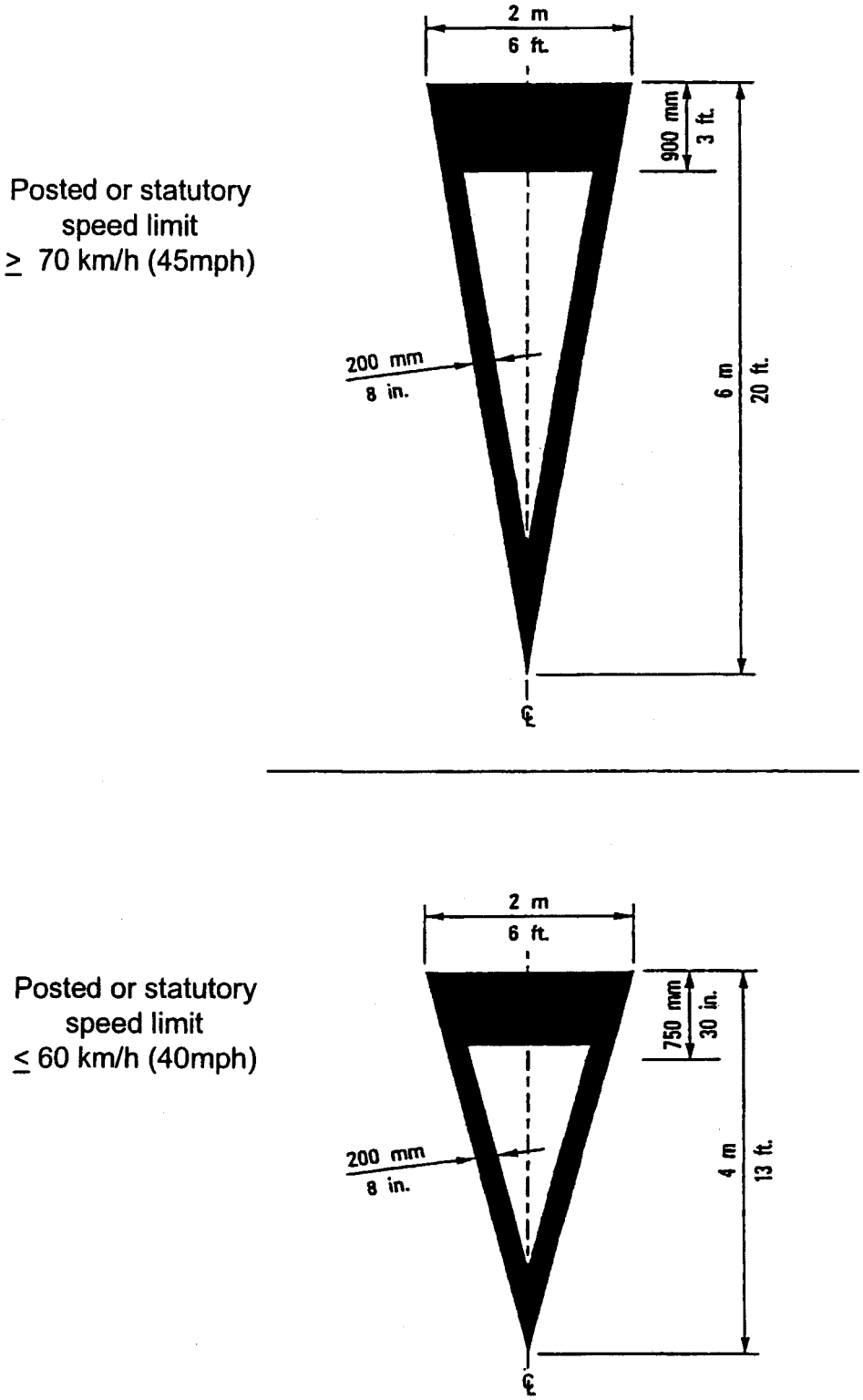


Figure 3-25. Typical Yield Ahead Triangle Symbols.

3B.13 Preferential Lane Word and Symbol Markings

Standard:

When a lane is assigned full or part time to a particular class or classes of vehicles, preferential lane markings shall be used.

Signs or signals shall be used with preferential lane word or symbol markings

All preferential lane word and symbol markings shall be white.

all preferential lane word and symbol markings shall be positioned laterally in the center of the preferred-use lane.

Support:

Preferential lanes may be designated to identify a wide variety of special uses. This could include, but is not limited to HOV (High Occupancy Vehicle) lanes, bicycle lanes, bus only lanes, taxicab only lanes, etc.

Standard:

Where a preferential lane use is established, the preferential lane shall be marked with one of the following symbol or word markings for the preferential lane use specified;

- HOV lane, the preferential lane use marking for HOV lanes shall consist of white lines formed in a diamond shape. The diamond shall be at least 750 mm (2.5 ft) wide and 3.6m (12 ft) in length. The lines shall be at least 150 mm (6 in) in width.
- Bicycle lane; the preferential lane use marking for a bicycle lane shall consist of a bicycle symbol or the word marking ''BIKE LANE.'' (See Section 9C, Markings, and Figures 9–4 through 9–9).
- Bus Only Lane; the preferential lane use markings for a busses only lane shall consist of the word markings ''BUS ONLY'' (See Section 3B.12).
- Taxi Only Lane; the preferential lane use marking for a taxi only lane shall consist of the word markings ''TAXI ONLY'' (See Section 3B.12).
- Other preferential lane use marking shall be identified in accordance with Section 3B.12.

Guidance:

Engineering judgement should determine the need for supplemental devices such as tubular markers, traffic cones, or flashing lights.

SUPPORT:

The spacing of the marking is an engineering judgement based on prevailing speed, block lengths, distance form intersections and other factors that affect clear communication to the road user. Markings spaced as close as 24 m (80 ft) apart might be appropriate on city streets, while markings spaced 300 m (1,000 ft) may be appropriate for freeways.

The vehicle occupancy requirements established for an HOV lane may be included in sequence after the diamond symbol. The word message ''HOV'' may be used in lieu of the diamond symbol.

3B.15 Curb Markings

Support:

Curb markings are most often used to indicate parking regulations or to delineate the curb.

Standard:

Signs shall be used with curb markings those areas where curb markings are frequently obliterated by snow and ice accumulation.

Where curbs are marked, the colors shall conform to the general principles of markings (Section 3A.5).

Guidance:

When curb markings are used without signs to convey parking regulations, a legible word marking regarding the regulation should be placed on the curb. For example, ''No Parking,'' or ''No Standing.''

Retroreflective solid yellow marking should be placed on paved median noses and the curbs of islands that are located in the line of traffic flow where the paved median nose or the curb serves to channel traffic to the right of the obstruction.

Retroreflective solid white marking should be used when traffic may pass on either side of the island.

Option: Local authorities may prescribe special colors for curb markings to supplement standard signs for parking regulation.

Support:

It is usually advisable to establish parking regulations by installing standard signs (Sections 2B.31, 2B.32 and 2B.33) because certain curb markings such as white and yellow curb markings are often used only for curb delineation and visibility purposes.

Where the curbs of the islands become parallel to the direction of traffic flow it is not necessary to mark the curbs unless an engineering study indicates the need for this type of delineation.

Curbs at openings in a continuous median island need not be marked unless an engineering study indicates the need for this type of marking.

3B.16 Preferential Lane Longitudinal Markings for Motorized Vehicles

Standard:

Preferential lane longitudinal markings for motorized vehicles shall be marked with the appropriate word or symbol pavement markings in accordance with Section 3B.13.

Support:

Preferential lanes can take many forms depending on the level of usage and the design of the facility. They may be physically separated from the other travel lanes by a barrier, median, or painted neutral area, or they may be concurrent with other travel lanes and be separated only by longitudinal pavement markings. Further, physically separated preferential lanes may operate in the same direction or be reversible.

Preferential lane may be operated either full-time (24 hours per day on all days), for extended periods of the day, or part-time (restricted usage during specific hours on specified days).

Standard:

The following four sections are presented in tabular form in Table 3–2:

2. Physically separated, non-reversible preferential lane; longitudinal pavement markings for preferential lane physically separated from the other travel lanes by a barrier, median, or painted neutral area shall consist of a single normal solid yellow line at the left edge of the travel lane(s), a single normal solid white line at the right edge of the travel lane(s), and if there are two or more preferential lanes, the travel lanes shall be separated with a normal broken white line. (See Figure 3.23a).

3. Physically separated, reversible preferential lane; longitudinal pavement markings for preferential lane shall consist of a single normal solid white line at both edges of the travel lane(s), and if there are two or more preferential lanes, the travel lanes shall be separated with a normal broken white line. (See Figure 3.23(a)).

4. Concurrent flow (left side) preferential lane; longitudinal pavement markings for a full-time or part-time preferential lane on the left side of the other traveled lanes, shall consist of a single normal solid yellow line at the left edge of the preferential travel lane(s) and one of the following at the right edge of the preferential travel lane(s):

a. a double solid wide white line where crossing is prohibited; see Figure 3–23(b);

b. a single solid wide white line where crossing is discouraged; see Figure 3–23(c);

c. a single broken wide white line where crossing is permitted; see Figure 3–23(d).

If there are two or more preferential lanes, the travel lanes shall be separated with a normal broken white line.

4. Concurrent flow (right side) preferential lane; longitudinal pavement markings for a full-time or part-time preferential lane on the right of the other travel lanes, shall consist of a single normal solid white line at the right edge of the preferential travel lane(s) if warranted and one of the following at the left edge of the preferential travel lane(s):

a. a double solid wide white line where crossing is prohibited; see Figure 3–23(b);

b. a single solid wide white line where crossing is discouraged; see Figure 3–23(c);

c. a single broken wide white line were crossing is permitted, see Figure 3–23(d);

d. a single dotted normal white line where crossing is permitted by any vehicle to perform a right turn maneuver; see Figure 3–23(e).

If there are two or more preferential lanes, the travel lanes shall be separated with a normal broken white line.

Guidance:

When concurrent flow preferential lanes and other travel lanes are separated by more than 1.2 m (4 ft) chevron markings should be placed in the neutral area. The chevron spacing should be 30 m (100 ft) or greater.

For full time or part-time concurrent flow preferential lanes, the spacing or skip pattern of the single broken wide white line may be reduced. The width of the single broken wide white line may also be increased.

TABLE 3–2. STANDARD LANE MARKINGS

Types of preferential lane		Longitudinal lane lines		
		Left edge line	Right edge line	2+ Lane centerline
Physically separated.	Non-reversible	Single normal solid yellow line	Single normal solid white line	Travel lanes shall be separated with a normal broken white line
	Reversible	Single normal solid white line at both edges	Single normal solid white line at both edges.	
Concurrent flow.	Left Side	Single normal solid yellow line at left edge ...	A double solid wide white line where crossing is prohibited; (See Figure 3–23b)..	
		.....	A single solid wide white line where crossing is discouraged; (See Figure 2–23c)..	
		.....	A single broken wide white line where crossing is permitted; (See Figure 3–23e)..	
	Right Side	A double solid wide white line where crossing is prohibited; (See figure 3–23e)..	Single normal solid white line at the right edge.	
		A single solid wide white line where crossing is discouraged; (See Figure 3–23e..		
		A single broken wide white line where crossing is permitted; (See Figure 3–23e)..		
		A single dotted normal white line where crossing is permitted for any vehicle to perform a right turn maneuver (See figure 3–23e)..		

The standard lane markings listed in this table is provided in a tabular format for reference. This information is also described in the second standard in Section 3B.16.

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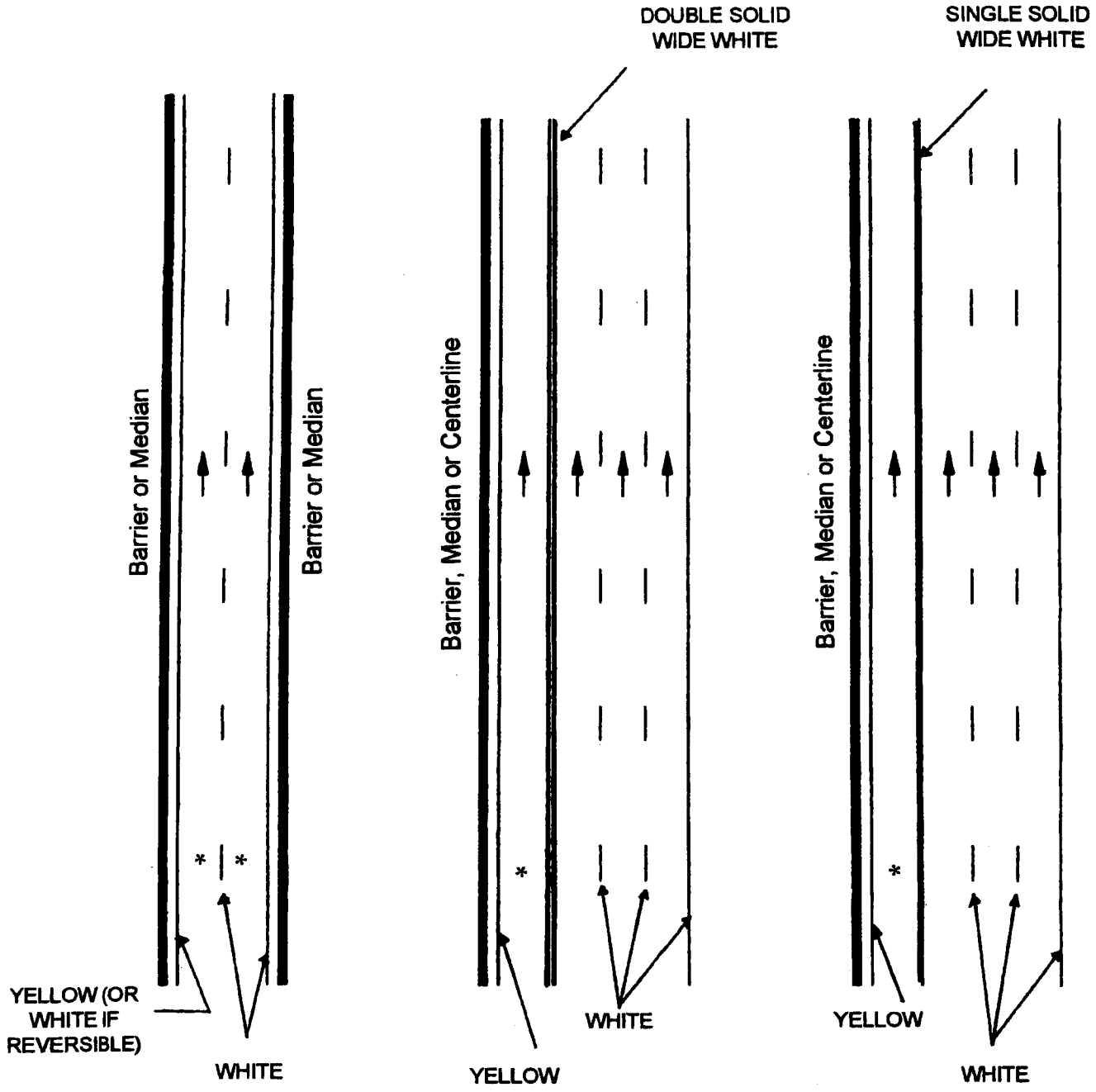


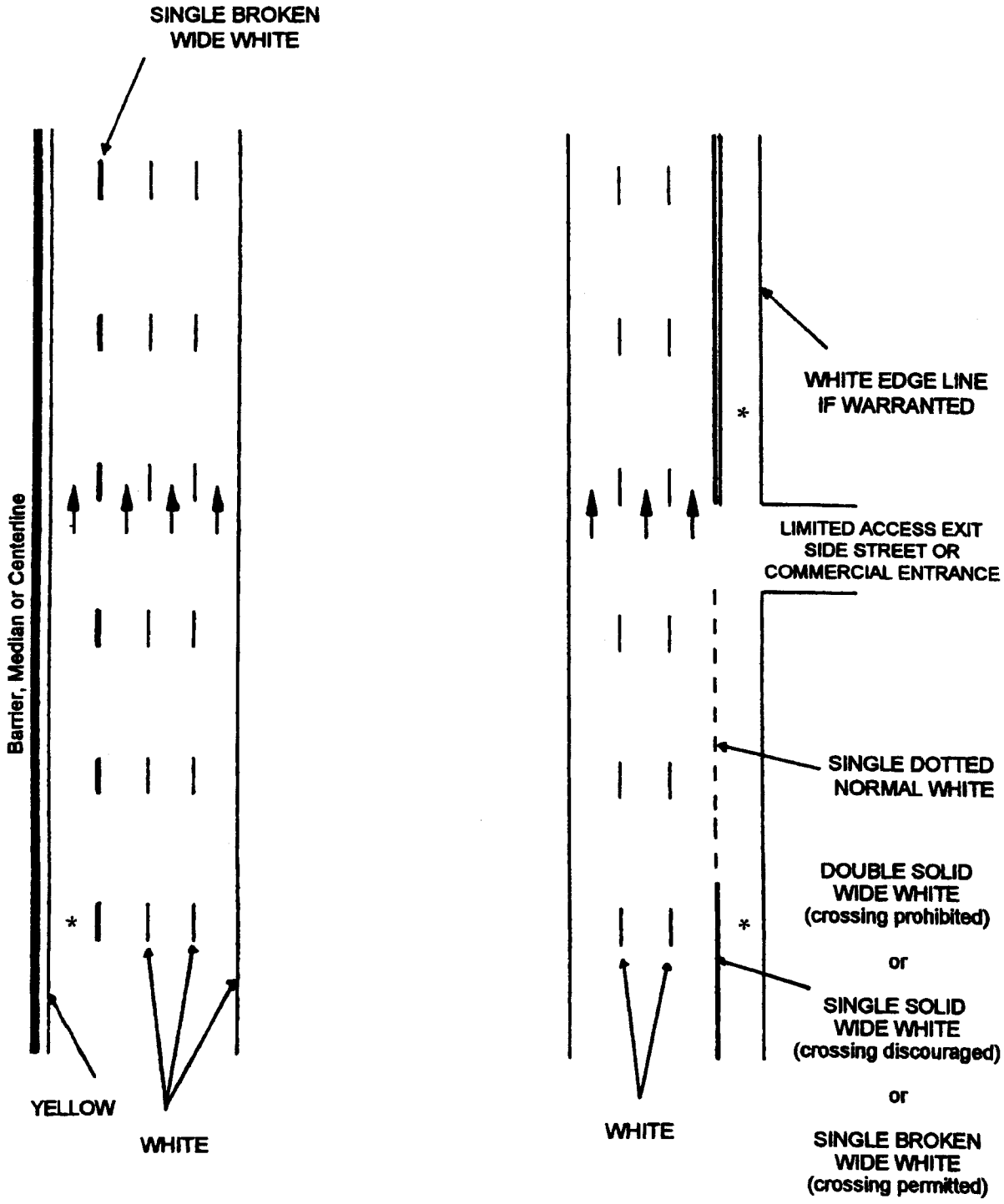
* - Applicable symbol or word

a - Physically separated permanent lanes(s)

b – Full-time concurrent lane(s) where enter/exit movements are PROHIBITED

c – Concurrent lane(s) where enter/exit movements are DISCOURAGED

Figure 3-23. Markings for Preferential Lanes for Motorized Vehicles



* – Applicable symbol or word

d – Concurrent lane(s) where enter/exit movements are ALLOWED

e – Right side concurrent lane(s)

Figure 3-23. Markings for Preferential Lanes for Motorized Vehicles (Continuation)

3B.17 Markings for Roundabouts

Support:

Roundabouts are distinctive circular roadways with the following three critical characteristics:

1. a requirement to yield at entry which gives a vehicle on the circular roadway the right-of-way; and

2. a deflection of the approaching vehicle around the central island; and

3. a flare or widening of the approach to match the width of the circular roadway.

Typical markings for roundabouts are shown in Figure 3–26 and 3–26a.

Option: A yellow edge line may be placed around the inner (left) edge of the circular roadway.

Guidance:

A white line should be used on the outer (right) side of the circular roadway as follows: a solid line along the splitter island and a dotted line across the lane(s) entering the roundabout.

Edge line extensions should not be placed across the exits from the circular roadway.

Where crosswalk markings are used, these markings should be located a minimum of 8m (25 ft) upstream for the yield line, or, if none, from the dotted white line.

Option: Lane lines may be used on the circular roadway when there is more than one lane.

3B.18 Markings for Other Circular Intersections

Support:

Other circular intersections include but are not limited to rotaries, traffic circles, and residential traffic calming designs.

Option: The markings shown in Figures 3–26 and 3–26a may be used in other circular intersections when engineering judgement indicates that their presence will benefit drivers and/or pedestrians.

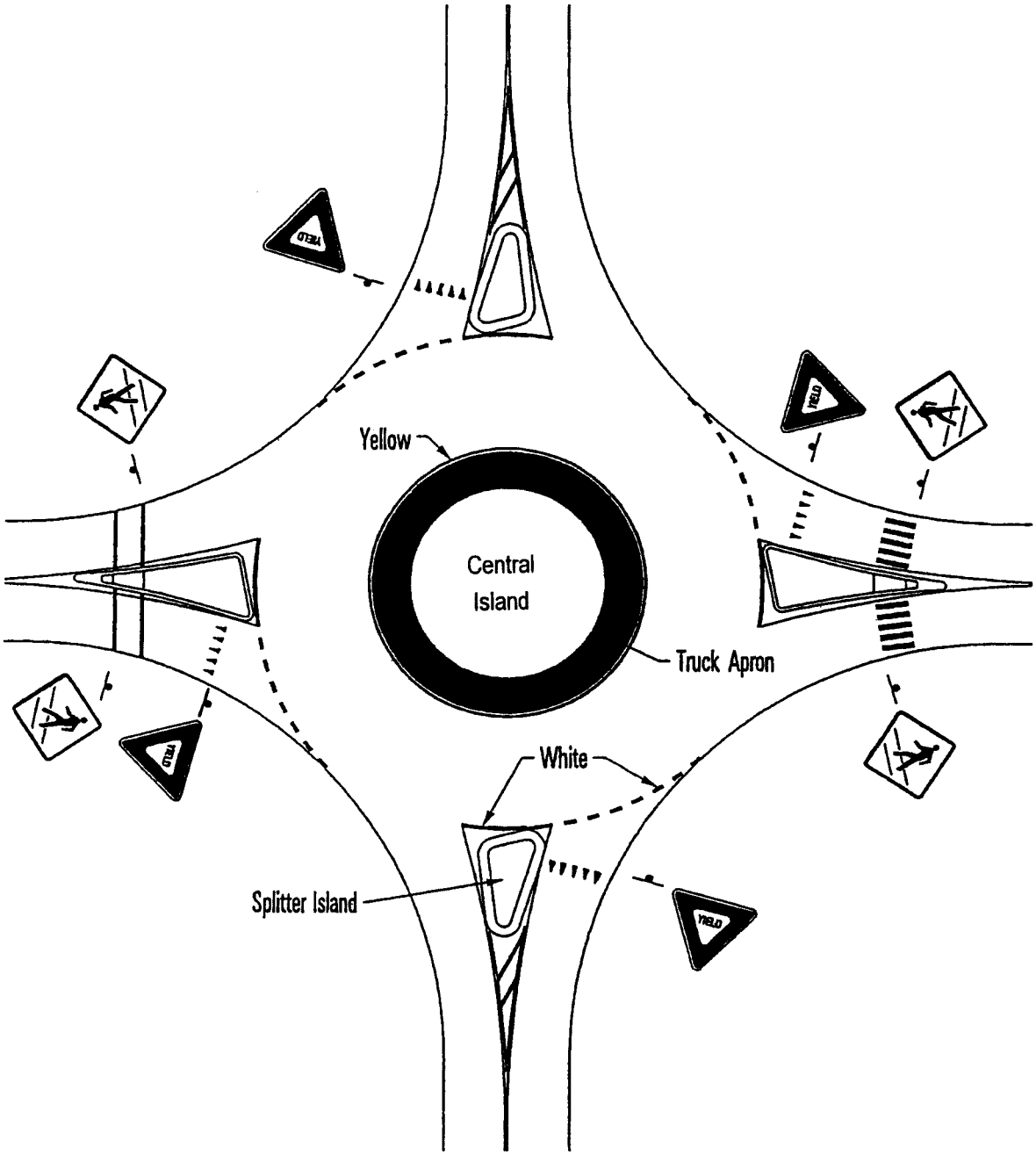


Figure 3-26. Typical Marking for Roundabouts.

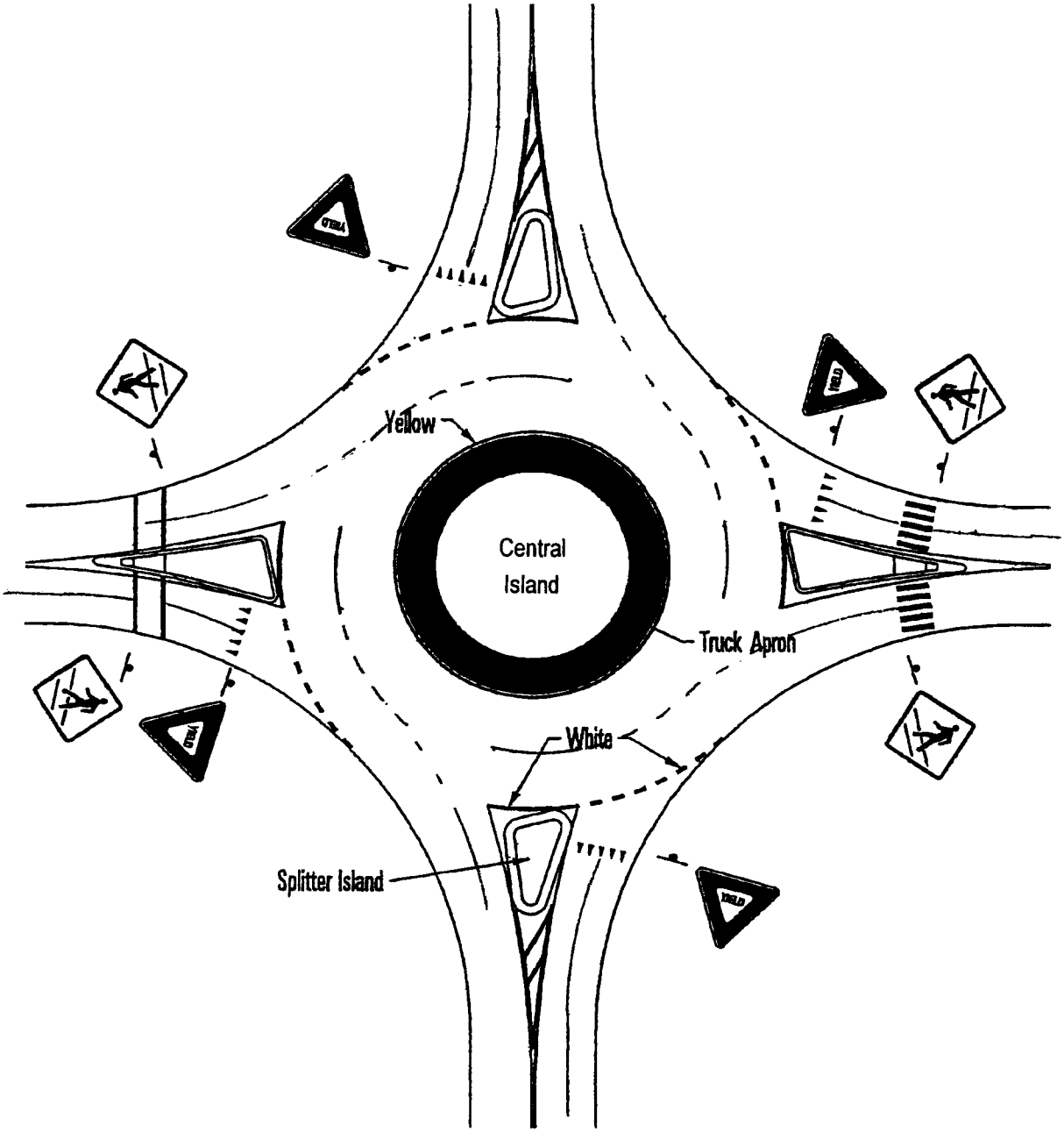


Figure 3-26a Typical Marking for Roundabouts.

3B.19 Speed Hump Markings

Standard:

Speed hump markings are a special white marking placed on a speed hump to identify its location.

Option: Speed humps, except those used for crosswalks, may be marked in accordance with Figure 3–27. The markings shown in Figure 3–28 may be used where the speed hump also functions with a crosswalk, or speed table.

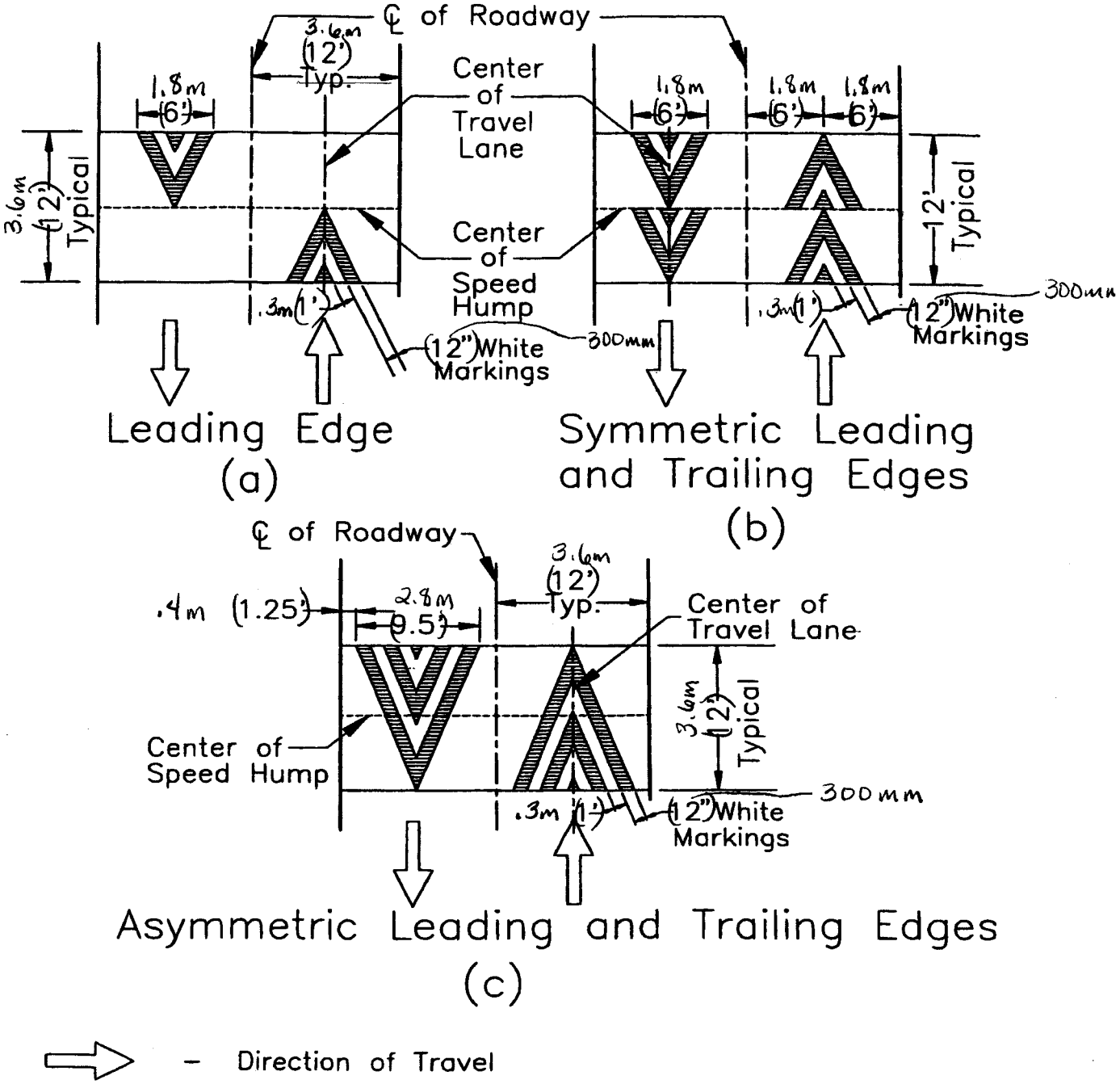


FIGURE 3-27. Pavement Markings for Speed Humps

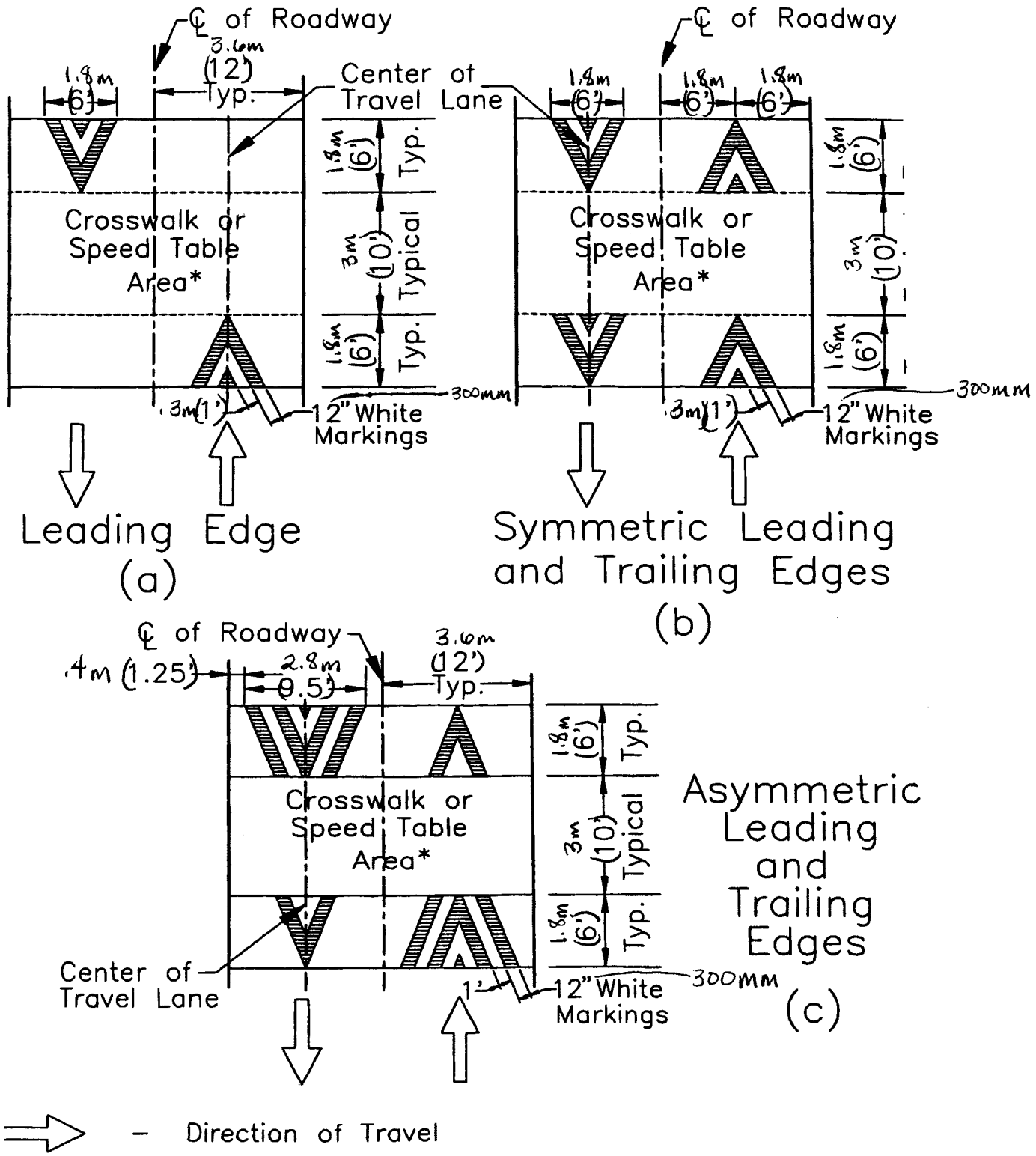


FIGURE 3-28. Pavement Markings for Speed Humps with Crosswalks

3B.20 Advance Speed Hump Marking

Standard:

Advance speed hump markings are a special white marking placed in advance of speed humps or other engineered, vertical roadway deflections such as dips.

Option: Advance speed hump markings may be used in advance of an engineered, vertical roadway deflection where added visibility is desired or where such deflection is not expected. (Figure 3–29)

Advance pavement wording such as ''BUMP'' or ''HUMP'' (see section 3B.12) may be used on the approach to a speed hump either alone or in conjunction with advance speed hump markings.

Guidance:

If used, advance speed hump markings should be installed in each approach lane.

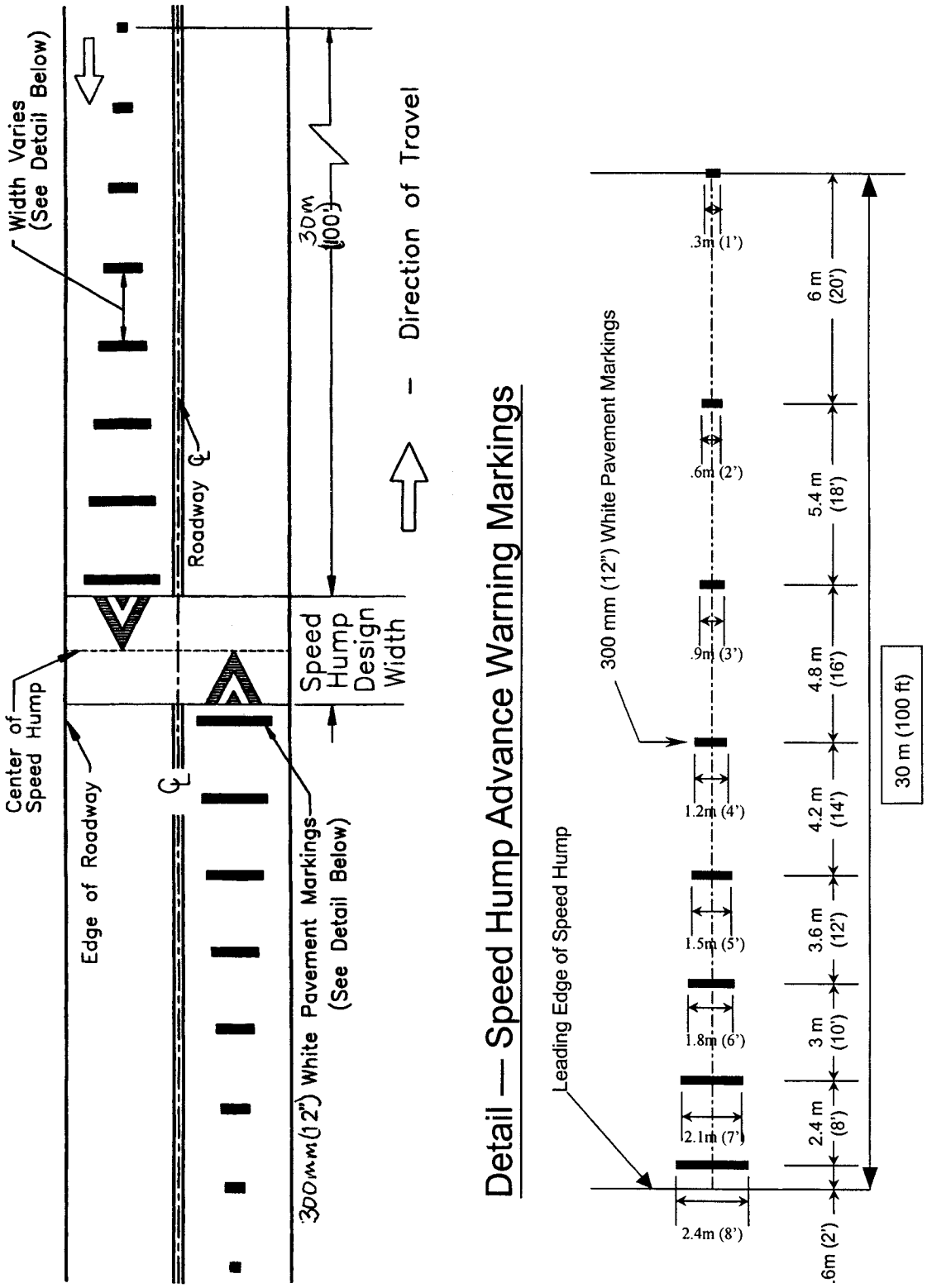


FIGURE 3-29. Advance Warning Markings for Speed Humps

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4B.2 Basis of Installation or Removal of Traffic Control Signals

Guidance:

The selection and use of highway traffic signals should be based on an engineering study of roadway, pedestrian, bicycle, and traffic conditions.

If changes in traffic patterns eliminate the need for a highway traffic signal, consideration should be given to removing it and replacing it with appropriate alternative traffic control devices.

Option: If the engineering study indicates that the traffic control signal is no longer justified, removal may be completed using the following steps:

a. Determine the appropriate traffic control to be used after removal of the signal.

b. Remove any sight-distance restrictions as necessary.

c. Inform the public of the removal study, for example by installing an information sign (or signs) with the legend TRAFFIC SIGNAL UNDER STUDY FOR REMOVAL at the signalized location in a position where it is visible to all road users.

d. Flash or cover the signal heads for a minimum of 90 days, and install the appropriate stop control or other traffic control devices.

e. Remove the signal if the engineering data collected during the removal study period confirms that the signal is no longer needed. Instead of total removal of the traffic control signal, the poles and cables may remain in place for a maximum of one year after removal of the signal heads for continued analysis.

Support:

A careful analysis of traffic operations, pedestrian needs, and other factors at a large number of signalized and unsignalized intersections, coupled with the judgment of experienced engineers, has provided a series of warrants, described in Section 4C, that define the minimum conditions under which installing highway traffic signals may be justified.

4C.1 Studies and Factors for Justifying Traffic Control Signals

Standard:

A traffic engineering study of traffic conditions, pedestrian characteristics, and physical characteristics of the location shall be performed to determine whether installation of a traffic control signal is justified at a particular location.

The investigation of the need for a traffic control signal shall include an analysis of the applicable factors contained in the following traffic signal warrants and other factors related to existing operation and safety at the study location:

Warrant 1—Eight-hour vehicular volume.
Warrant 2—Four-hour vehicular volume.
Warrant 3—Peak hour.
Warrant 4—Pedestrian volume.
Warrant 5—School crossing.
Warrant 6—Coordinated signal system.
Warrant 7—Accident experience.
Warrant 8—Roadway network.

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Guidance:

A traffic control signal should not be installed unless one or more of the factors described in this section are met.

A traffic control signal should not be installed unless an engineering study indicates that installing a traffic control signal will improve the overall safety and/or operation of the intersection.

A traffic control signal should not be installed if it will seriously disrupt progressive traffic flow.

The study should consider the effects of the right-turn vehicles from the minor-roadway approaches. Engineering judgment should be used to determine what, if any, portion of the right-turn traffic is subtracted from the minor-roadway traffic count when evaluating the count against the above warrants.

Engineering judgment should also be used in applying various traffic signal warrants to cases where approaches consist of one lane plus one left-turn or right-turn lane. The site-specific traffic characteristics dictate whether an approach should be considered one lane or two lanes. For example, for a roadway approach with one lane (for through and right-turning traffic) plus a left-turn lane, engineering judgment could indicate that it should be considered a one-lane approach if the traffic using the left-turn lane is minor. In such a case, the total traffic volume approaching the intersection should be applied against the warrants as a one-lane approach. The approach should be considered two lane if traffic splits in half and the left-turn lane is sufficient length to accommodate all left-turn vehicles.

Similar judgment and rationale should be applied to a roadway approach with one lane plus a right-turn lane. In this case, the degree of conflict of minor-roadway right-turn traffic with traffic on the major roadway should be considered. Thus, right-turn traffic should not be included in the minor-roadway volume if the movement enters the major roadway with minimal conflict. The approach should be evaluated as a one-lane approach, and only the traffic volume in the through/left-turn lane considered.

At a location that is under development or construction and where it is not possible to obtain a traffic count that would represent future traffic conditions, vehicular and pedestrian hourly volumes should be estimated as part of an engineering study for comparison with traffic signal warrants.

For warrant analysis, a location with a wide-median should be considered as one intersection.

Option: Engineering study data may include the following:

a. The number of vehicles entering the intersection in each hour from each approach during 12 consecutive hours of an average day. The 12 hours selected should contain the greatest percentage of the 24-hour traffic volume.

b. Vehicular volumes for each traffic movement from each approach, classified by vehicle type (heavy trucks, passenger cars and light trucks, public-transit vehicles, and, in some locations, bicycles), during each 15-minute period of the two hours in the morning and two hours in the afternoon during which total traffic entering the intersection is greatest.

c. Pedestrian volume counts on each crosswalk during the same periods as the vehicular counts in paragraph b above and during hours of highest pedestrian volume. Where people who are young, elderly, physically challenged, have visual disabilities, or need special consideration, the pedestrians and their crossing times may be classified by general observation.

d. Information about nearby facilities and activity centers that serve the elderly, people with disabilities, and/or requests from people with disabilities for accessible crossing improvements along this route. These people may not be adequately reflected in the pedestrian volume count if the lack of a signal restrains their mobility.

e. The posted or statutory speed limit or the 85th-percentile speed on the uncontrolled approaches to the location.

f. A condition diagram showing details of the physical layout, including such features as inter-sectional geometrics, channelization, grades, sight-distance restrictions, bus stops and routings, parking conditions, pavement markings, roadway lighting, driveways, nearby railroad crossings, distance to nearest highway traffic signals, utility

poles and fixtures, and adjacent land use.

g. A collision diagram showing accident experience by type, location, direction of movement, severity, time of day, date and day of week for at least one year.

The following data, which are desirable for a more precise understanding of the operation of the intersection, may be obtained during the periods specified in paragraph b above:

a. Vehicle-seconds delay determined separately for each approach.

b. The number and distribution of gaps in vehicular traffic on the major roadway when minor-roadway traffic finds it difficult to use the intersection safely.

c. The posted or statutory speed limit or the 85th-percentile speed on controlled approaches at a point near to the intersection but unaffected by the control.

d. Pedestrian delay time for at least two 30-minute peak pedestrian delay periods of an average weekday or like periods of a Saturday or Sunday.

4D.3 Provisions for Pedestrians

Support:

Chapter 4E contains additional information regarding pedestrian signals.

Standard:

The design and operation of traffic control signals shall take into consideration the needs of pedestrians, including those with disabilities, as well as vehicular traffic.

If engineering judgment indicates the need for pedestrian provisions for a given pedestrians or other non-motorist movement, signal faces conveniently visible to pedestrians shall be provided by pedestrian signal heads or a signal face for an adjacent vehicular movement.

Guidance:

Safety considerations should include the installation, where appropriate, of accessible pedestrian signals that provide information in non-visual format (including audible tones, verbal messages, and/or vibrotactile information). Provisions for accessible signals are presented in Sections 4E.6 and 4E.8.

Where pedestrian movements regularly occur but are low in volume, pedestrians should be provided with sufficient time to cross the roadway by adjusting the traffic control signal operation and timing to continually provide sufficient crossing time or by providing pedestrian detectors.

Option: If it is desirable to prohibit certain pedestrian movements at a traffic control signal, a NO PEDESTRIAN CROSSING sign (R9–3a, R9–3) may be used. (see Section 2B.36.)

4D.4 Meaning of Vehicle Signal Indications

Support:

The Uniform Vehicle Code is the primary source for the standards for the meaning of vehicle signal indications to both vehicle operators and pedestrians set forth below, and the standards for the meaning of separate pedestrian signal indications as set forth in Section 4D.2.

Standard:

Unless otherwise determined by law, the following meanings shall be given to highway traffic control signal indications for vehicles and pedestrians:

a. Steady green indications shall have the following meanings:

(1) Traffic, except pedestrians, facing a CIRCULAR GREEN indication may proceed straight through or turn right or left except as such movement is modified by lane-use signs, turn prohibition signs, lane markings, or roadway design. But vehicular traffic, including vehicles turning right or left, shall yield the right-of-way to other vehicles, and to pedestrians lawfully within the intersection or an adjacent crosswork, at the time such signal indication is exhibited.

(2) Traffic, except pedestrians, facing a GREEN ARROW indications, shown alone or in combination with another indication, may cautiously enter the intersection only to make the movement indicated by such arrow or such other movement as is permitted by other indications shown at the same time. Such vehicular traffic shall yield the right-of-way to pedestrians lawfully within an adjacent crosswalk and to other traffic lawfully using the intersection.

(3) Unless otherwise directed by a pedestrian signal head, pedestrians facing any green indication, except when the sole green indication is a turn arrow, may proceed across the roadway within any marked or unmarked crosswalk.

b. Steady yellow indications shall have the following meanings:

(1) Traffic, except pedestrians, facing a steady CIRCULAR YELLOW or YELLOW ARROW indication is thereby warned that the related green movement is being terminated or that a red indication will be exhibited immediately thereafter, when vehicular traffic shall not enter the intersection.

(2) Pedestrians facing a steady CIRCULAR YELLOW or YELLOW ARROW indication, unless otherwise directed by a pedestrian signal head, are thereby advised that there is insufficient time to cross the roadway before a red indication is shown, and no pedestrian shall then start to cross the roadway.

c. Steady red indications shall have the following meanings:

(1) Vehicular traffic facing a steady CIRCULAR RED indication alone shall stop at a clearly marked Stop line, but if there is no stop line, traffic shall stop before entering the crosswalk on the near side of the intersection, or if there is no crosswalk, then before entering the intersection, and shall remain standing until an indication to proceed is shown, or as provided below.

Except when a sign is in place prohibiting a turn on red, vehicular traffic facing a CIRCULAR RED indication may enter the intersection to turn right, or to turn left from a one-way roadway into a one-way roadway, after stopping. Such vehicular traffic shall yield the right-of-way to pedestrians lawfully within an adjacent crosswalk and to other traffic lawfully using the intersection.

(2) Unless otherwise directed by a pedestrian signal head, pedestrians facing a steady CIRCULAR RED indication alone shall not enter the roadway.

d. Flashing signal indications shall have the following meanings:

(1) Flashing yellow—When a yellow lens is illuminated with rapid intermittent flashes, drivers of vehicles may proceed through the intersection or past such indication only with caution.

(2) Flashing red—When a red lens is illuminated with rapid intermittent flashes, drivers of vehicles shall stop at a clearly marked stop line, but if there is no stop line, they shall stop, before entering the crosswalk on the near side of the intersection, or if there is no crosswalk, at the point nearest the intersecting roadway where the driver has a view of approaching traffic on the intersecting roadway before entering the intersection. The right to proceed shall be subject to the rules applicable after making a stop at a STOP sign.

(3) Flashing YELLOW ARROW indications have the same meaning as the corresponding flashing circular indication, except that they apply only to drivers of vehicles intending to make the movement indicated by the arrow.

4D.5 Application of Steady Signal Indications

Standard:

When a traffic signal installation is being operated in a steady (stop-and-go)

mode, at least one lens in each signal face shall be illuminated at any given time.

A signal face(s) that controls a particular vehicular movement during any interval of a cycle shall control that same movement during all intervals of the cycle.

Steady signal indications shall be applied as follows:

a. A steady CIRCULAR RED indication

(1) Shall be displayed when it is intended to prohibit traffic, except pedestrians directed by a pedestrian signal head, from entering the intersection or other controlled area. Turning after stopping is permitted as stated in Section 4D.4(c)(1).

(2) Shall be displayed with the appropriate GREEN ARROW indications when it is intended to permit traffic to make a specified turn and to prohibit traffic from proceeding straight ahead through the intersection or other controlled area, except in exclusive mode turn signal faces.

b. A steady CIRCULAR YELLOW indication

(1) Shall be displayed following a CIRCULAR GREEN indication in the same signal face.

(2) Shall not be displayed in conjunction with the change from the CIRCULAR RED indication to the CIRCULAR GREEN indication.

(3) Shall be followed by the display of a CIRCULAR RED indication except that, when entering preemption operation, the display of the previous CIRCULAR GREEN indication shall be permitted following a CIRCULAR YELLOW indication. (See Section 4D.13.)

c. A steady CIRCULAR GREEN indication shall be displayed only when it is intended to permit traffic to proceed in any direction that is lawful and practical.

d. A steady YELLOW ARROW indication

(1) Shall be displayed in the same direction as a GREEN ARROW indication following a GREEN ARROW indication in the same signal face, unless the GREEN ARROW indication and a CIRCULAR GREEN indication terminate simultaneously in the same signal face.

(2) Shall not be displayed when any conflicting vehicular movement has a green or yellow indication or any conflicting pedestrian movement has a WALK or flashing DONT WALK indication. (See Section 4D.9.)

(3) Shall be terminated by a CIRCULAR YELLOW indication or a CIRCULAR RED indication except

(a) When entering preemption operation, the display of the previous GREEN ARROW indication shall be permitted following a YELLOW ARROW indication.

(b) When the movement controlled by the arrow is to continue as permitted during a subsequent CIRCULAR GREEN indication.

e. A steady GREEN ARROW indication

(1) Shall be displayed only to allow vehicular movements, in the direction indicated, that are not in conflict with other vehicles moving on a green or yellow indication or with pedestrians crossing in conformance with a WALK or flashing DONT WALK indication. (see Section 4D.9.)

(2) Shall be displayed on a signal face that controls a left-turn movement when said movement is not in conflict with other vehicles moving on a green or yellow indication or with pedestrians crossing in conformance with a WALK or flashing DONT WALK indication. (See Section 4D.9.)

(3) Shall not be required on the stem of T intersections or for turns from one-way roadways.

Option: Steady YELLOW ARROW, and GREEN ARROW indications, if not otherwise prohibited, may be used in lieu of the corresponding circular indications at the following locations:

a. On an approach intersecting a one-way roadway.

b. Where certain movements are prohibited.

c. Where certain movements are physically impossible.

4D.6 Application of Steady Signal Indications For Left Turns

Support:

Left-turning traffic is controlled by one of four modes as follows:

a. Permissive Mode—turns made on the CIRCULAR GREEN indication after yielding to oncoming traffic and pedestrians.

b. Protected Mode—turns made only when the left-turn GREEN ARROW indication is displayed.

c. Protected/Permissive Mode—both modes occur on an approach during the same cycle.

d. Variable left-turn mode—the operating mode changes among the protected mode and/or the protected/permissive mode and/or the permissive mode.

Standard:

A leading protected-only left turn phase is one in which the GREEN ARROW, YELLOW ARROW, and CIRCULAR RED is given to vehicles turning left from a particular street before the CIRCULAR GREEN indication is given to the through movement on the same street.

Option:

A leading protected-only left turn phase may be considered if there are not a sufficient number of acceptable gaps for the left-turning movement.

Standard:

The required left-turn signal indication or indications shall be determined by the selected mode of left-turn operation, as follows:

a. Permissive Mode only—The signal indication for permissive mode left turns shall be identical to the signal indication for through traffic. A separate signal indication or signal face for left turns shall not be required.

b. Protected Mode only—At least one left-turn signal face shall be provided in addition to the two approach signal faces required in Section 4D.15 for the through movement. The left-turn signal face shall be capable of displaying one of the following sets of indications:

(1) GREEN and YELLOW left-turn ARROW indications and a CIRCULAR RED indication. Only one of the three lenses shall be illuminated at any given time. If the CIRCULAR RED indication would be readily visible to other traffic on the same approach, either a LEFT TURN SIGNAL sign (R10–10) or a visibility-limited CIRCULAR RED signal indication shall be used.

(2) CIRCULAR RED, CIRCULAR YELLOW, CIRCULAR GREEN, and left-turn GREEN ARROW indications. This four-section signal face shall be used only when the CIRCULAR GREEN and left-turn GREEN ARROW indications begin and terminate together. During each interval, the circular indications shall be the same as the indication on the signal face(s) for the adjacent through traffic.

c. Protected/Permissive Mode—A separate signal face is not required for the left turn, but, if provided, it shall be considered an approach signal face, and shall meet the following requirements:

(1) During the protected left-turn movement, the signal face shall simultaneously display:

a) a left-turn GREEN ARROW; and

b) a circular indication that is the same as the indication for the adjacent through lane on the same approach as the protected left-turn.

During the protected left-turn movement, the signal face for through traffic on the opposing approach shall simultaneously display a CIRCULAR RED indication.

(2) During the permissive left-turn movement, all signal faces on the

approach shall display the CIRCULAR GREEN indication.

(3) All signal faces on the approach shall simultaneously display the same color of circular indications to both through and left-turn road users.

(4) A supplementary sign shall not be required. If used, it shall be a LEFT TURN YIELD ON GREEN (symbolic green ball) sign (R10–12).

d. Variable left-turn mode—If the protected mode occurs during one or more periods of the day, and the permissive mode or the combined protected/permissive mode occurs during other periods of the day, the requirements of paragraphs a, b, and c above that are appropriate to that mode of operation shall be met subject to the following:

(1) Signal faces for the protected mode shall not be limited to three signal sections,

(2) The display of the CIRCULAR GREEN and CIRCULAR YELLOW indications shall not be required when operating in the protected mode.

(3) The left-turn GREEN ARROW and left-turn YELLOW ARROW indications shall not be displayed when operating in the permissive mode.

(4) A supplementary sign shall not be required. If used, both the LEFT TURN SIGNAL sign (R10–10) and the LEFT TURN YIELD ON GREEN (symbolic green ball) sign (R10–12) shall be provided.

4D.7 Application of Steady Signal Indications For Right Turns

Support:

Right-turning traffic is controlled by one or four modes as follows:

a. Permissive Mode—turns made on the CIRCULAR GREEN indication after yielding to pedestrians.

b. Protected mode—turns made only when the right-turn GREEN ARROW indication is displayed.

c. Protected Permissive Mode—both modes occur on an approach during the same cycle.

d. Variable Right-Turn Mode—the operating mode changes among the protected mode, the protected/permissive mode, and/or the permissive mode during different periods of the day.

Standard:

The required right-turn signal faces and operation shall be determined by the selected mode of right-turn operation, as follows:

a. Permissive Mode only—A separate signal indication or signal face for right turns shall not be required. The signal indication for permissive mode right turns shall be identical to the indication for adjacent through traffic, except that if the right turn is held to provide an exclusive pedestrian movement, a separate right-turn RED CIRCULAR indication shall be provided along with a RIGHT TURN SIGNAL sign, R10–10.

b. Protected Mode only—At least one right-turn signal face shall be provided in addition to the two approach signal faces required for the through movement in Section 4C–15. The right-turn signal face shall be capable of displaying one of the following sets of indications:

(1) GREEN and YELLOW right-turn ARROW indications and a CIRCULAR RED indication. Only one of three lenses shall be illuminated at any given time. If the CIRCULAR RED indication would be readily visible to other traffic movements on the same approach, either a RIGHT TURN SINGLE sign (R10–120) or a visibility-limited CIRCULAR RED signal indication shall be used; or

(2) CIRCULAR RED, CIRCULAR YELLOW, CIRCULAR GREEN, and right-turn GREEN ARROW indications. This four-section signal shall be used only when the CIRCULAR GREEN and left-turn GREEN ARROW indications begin and terminate together. During each interval, the circular indication shall be the same as the indication on the signal faces for adjacent through traffic.

c. Protected/Permissive Mode—A separate signal face is not required for the right turn, but, if provided, it shall be considered an approach signal face, and shall meet the following requirements.

(1) During the protected right-turn movement, the single face shall simultaneously display:

(a) a right-turn GREEN ARROW indication and

(b) a circular indication that is identical to the adjacent through lane indication on the same approach with the protected right turn.

(2) During the permissive right-turn movement, all signal faces on the approach shall display the CIRCULAR GREEN indication.

(3) All signal faces on the approach shall simultaneously display the same color of circular indications to both through and right-turn road users.

d. Variable right-turn mode—If the protected mode occurs during one or more periods of the day, and the permissive mode or the combined protected/permissive mode occurs during other periods of the day, the requirements of paragraphs a, b, and c above that are appropriate to that mode of operation shall be met subject to the following:

(1) Signal faces for the protected mode shall not be limited to three signal sections.

(2) The display of the CIRCULAR GREEN and CIRCULAR YELLOW indications shall not be required when operating in the exclusive mode.

(3) The right-turn GREEN ARROW and right-turn YELLOW ARROW indications shall not be displayed when operating in the permissive mode.

Additional appropriate signal indications or changeable message signs shall be used, if necessary, to meet these requirements.

4D.8 Prohibited Steady Signal Indications

Standard:

The following combinations of signal indications shall not be simultaneously displayed on any one signal face:

a. CIRCULAR GREEN with CIRCULAR YELLOW.

b. CIRCULAR RED with CIRCULAR YELLOW.

c. CIRCULAR GREEN with CIRCULAR RED.

d. Straight-through GREEN ARROW with CIRCULAR RED.

The above combinations shall not be simultaneously displayed in different signal faces on any one approach unless:

a. One of the signal faces is a turn signal controlling only a protected mode, and a RIGHT (LEFT) TURN SIGNAL sign (R10–10) (see Sections 4D.6 and 4D.7) is mounted adjacent to each such signal face.

b. The signal faces are shielded, hooded, louvered, positioned, or designed so that the combination is not confusing to approaching road users.

The straight-through, left-turn, and right-turn RED ARROWs and the straight-through YELLOW ARROW signal indications shall not be displayed on any signal face, either alone or in combination with any other indication.

4D.11 Application of Flashing Signal Indications

Standard:

The light source of a flashing signal indication shall be flashed continuously at a rate of not less than 50 nor more then 60 times per minute. The illuminated period of each flash shall be not less than half and not more than two-thirds of the total flash cycle.

Flashing indications shall comply with the requirements of other sections of this manual regarding shielding or positioning of the display of conflicting signal indications except that flashing yellow indications for through traffic

shall not be required to be shielded or positioned to prevent visual conflict for road users in separately-controlled turn lanes.

The following applications shall apply whenever a traffic control signal is operated in the flashing mode:

a. Each approach or protected mode turn movement that is controlled during steady mode (stop-and-go) operation shall display a signal indication during flashing operation.

b. All signal faces that are flashed on an approach shall flash the same color, either yellow or red, except that separate signal faces for protected mode turn movements shall be permitted to flash a CIRCULAR RED indication when the through indications are flashed yellow.

c. The appropriate YELLOW ARROW indication shall be flashed when a signal face contains a YELLOW ARROW and a GREEN ARROW.

d. If a signal face includes both circular and arrow lenses of the color that is to be flashed, only the circular indication shall be flashed.

When a traffic control signal is operated in the flashing mode, a flashing yellow indication should be used for the major roadway and a flashing red indication should be used for the other approaches unless flashing red indications are used on all approaches.

4D.15 Number and Location of Signal Faces by Approach

Support:

Sections 4D.5, 4D.17, and 4D.18 contain additional information regarding the design of signal faces.

Standard:

The signal faces for each approach to an intersection or a mid-block location shall be provided as follows:

a. A minimum of two signal faces shall be provided:

(1) For through traffic.

(2) For one of the turning movements (left or right) if no through movement exists, such as on the stem approach to a T intersection.

b. See Section 4D.6 for left-turn signal indications.

c. See Section 4D.7 for right-turn signal indications.

d. Except where the width of an intersecting roadway or other conditions make it physically impractical,

(1) A signal face installed to satisfy paragraphs b and c above and at least one and preferably both of the signal faces required by paragraph a above shall be located:

(a) Not less than 12 m (40 ft) beyond the stop line.

(b) Not more than 45 m (150 ft) beyond the stop line unless a supplemental near side signal face is provided.

(c) As near as practicable to the line of the driver's normal view, if mounted over the roadway.

(2) A signal face installed to satisfy paragraphs b and c above and at least one and preferably both of the signal faces required by paragraph a above shall be located no higher than at a maximum height to the top of the signal housing mounted over a roadway of 7.8 meters (25.6 feet) above the pavement. For viewing distances between 12 meters (40 feet) and 16 meters (53 feet) from the stop line, the maximum mounting height to the top of the signal housing shall be as shown on Figure 4–5.

(3) At least one and preferably both of the signal faces required by paragraph a above shall be located between two lines intersecting with the center of the approach at a point 3 m (10 ft) behind the stop line, one making an angle of approximately 20 degrees to the right of the center of the approach extended, and the other making an angle of approximately 20 degrees to the left of the center of the approach extended (see Figure 4–6).

(4) If both of the signal faces required by paragraph a above are on mounted-posts, they shall both be on the far sides of the intersection, one of the right and one on the left of the approach lane(s).

e. If the minimum sight distance in Table 4–2 cannot be met, sign shall be erected to warm approaching traffic of the signal.

f. Required signal faces for through traffic on any one approach shall be placed not less than 2.5 m (8 ft) apart measured horizontally between the centers of the signal faces.

g. If more than one turn signal face is provided for a protected-mode turn, the signal faces shall be placed not less than 2.5 m (8 ft) apart measured horizontally between the centers of the signal faces.

h. If supplemental signal faces are used, the following limitations shall apply:

(1) Left-turn arrows shall not be used in near-right signal faces.

(2) Right-turn arrows shall not be used in far-left signal faces. A far-side median mounted signal face shall be considered a far-left signal for this application.

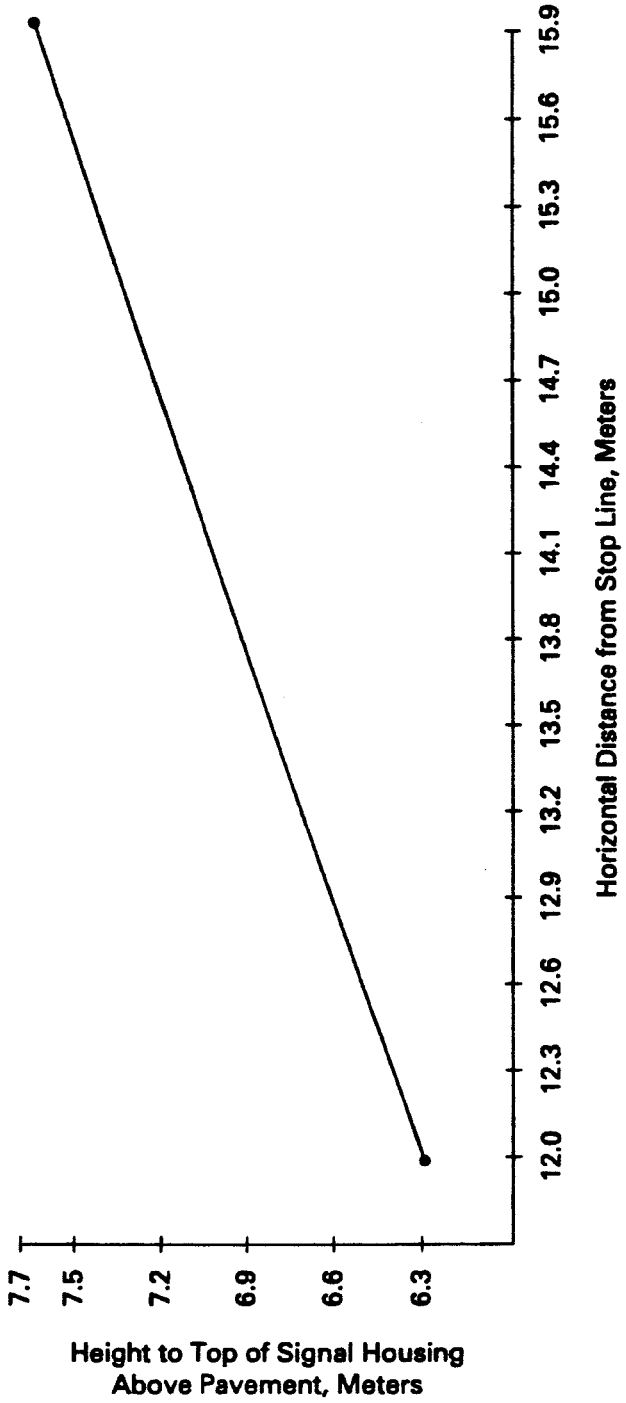

Figure 4-5. Maximum mounting height of signal heads located between 12 meters (40 feet) and 16 meters (53 feet) from stop line

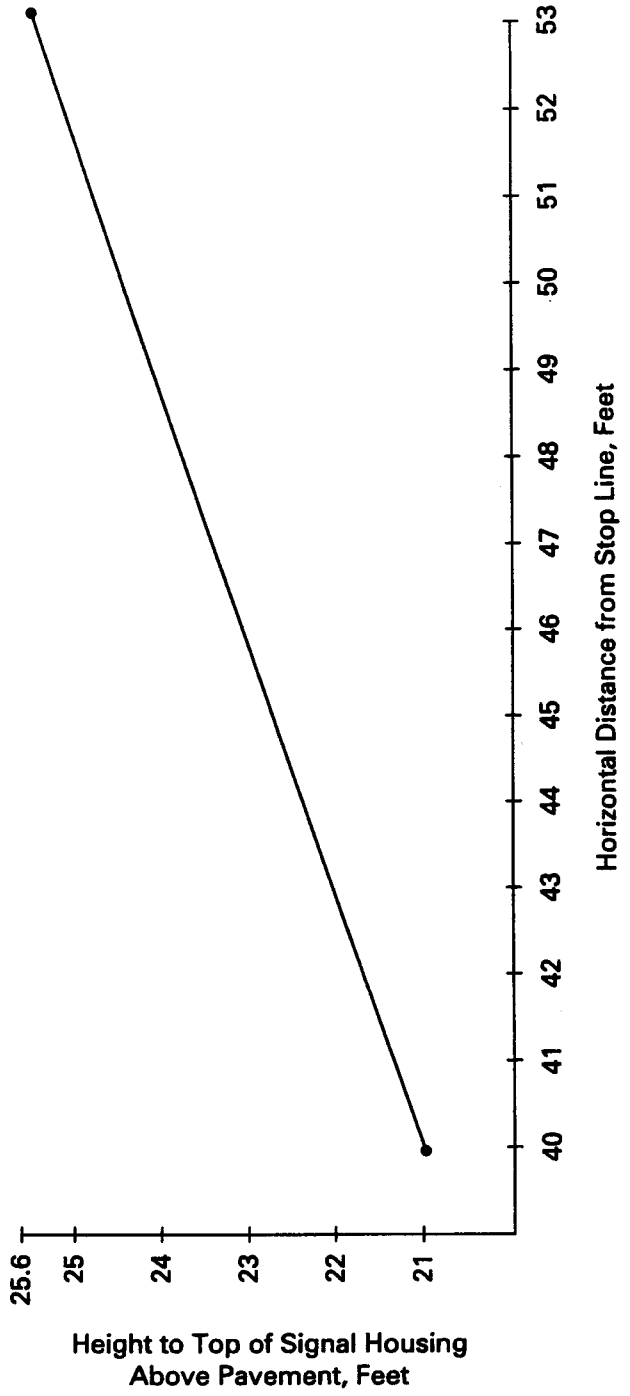

Figure 4-5. Maximum mounting height of signal heads located between 12 meters (40 feet) and 16 meters (53 feet) from stop line

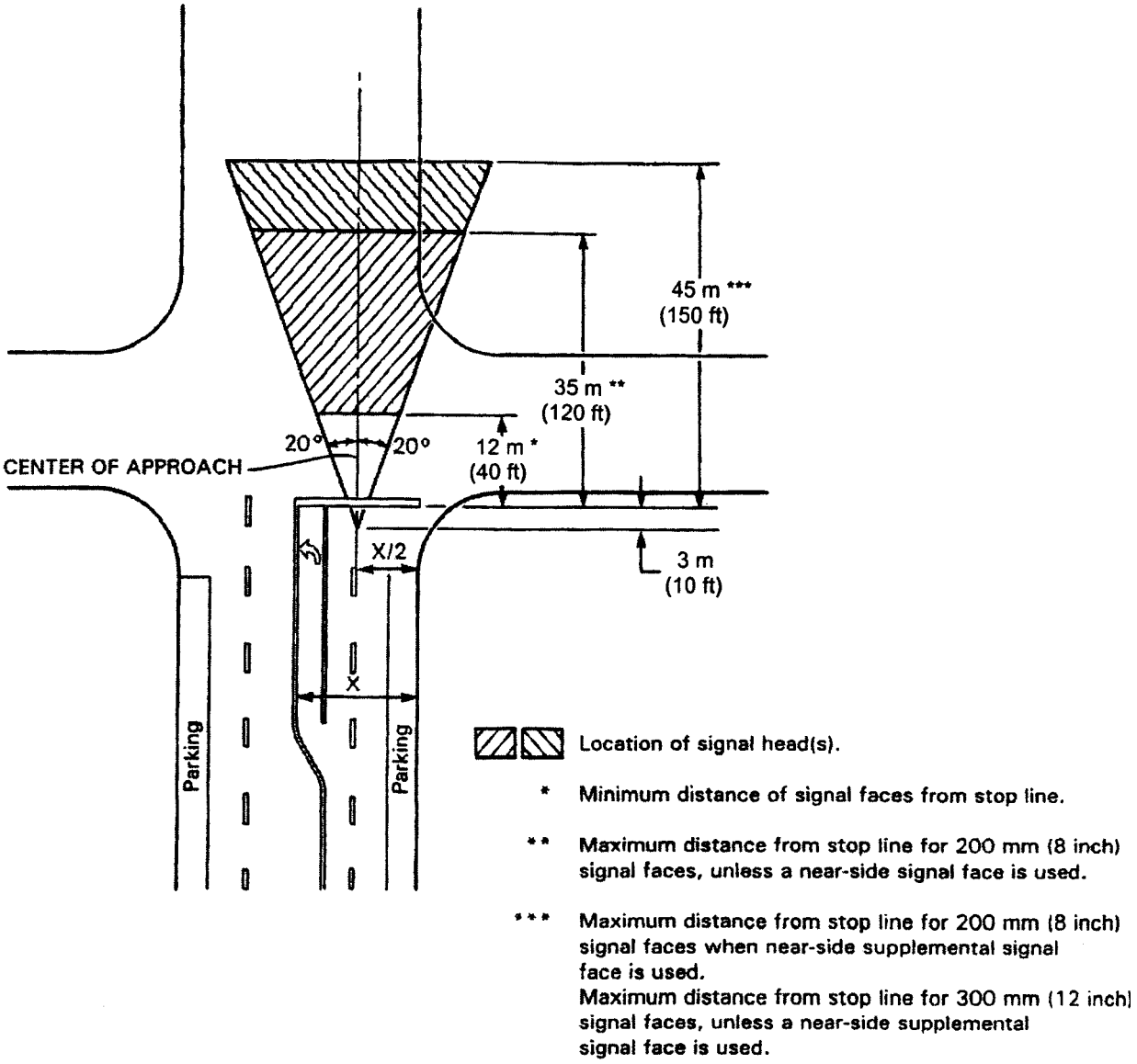

Figure 4-6. Illustration of Section 4D.15.

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TABLE 4–2.—MINIMUM SIGHT DISTANCE

85th-Percentile Speed		Minimum Sight Distance	
km/h	mph	meters	feet
30	20	50	175
40	25	65	215
50	30	85	270
60	35	100	325
60	40	120	390
70	45	140	460
80	50	165	540
90	55	195	625
100	65	220	715

Guidance:

The two signal faces required for each approach should be continuously visible to traffic approaching the traffic control signal, from a point at least the minimum sight distance indicated in Table 4–2 in advance of and measured to the stop line. This range of continuous visibility should be provided unless precluded by a physical obstruction or unless another signalized location is within this range.

If two or more left-turn lanes are provided for a separately-controlled exclusive mode only left-turn movement or if a left-turn movement represents the major movement from an approach, two left-turn signal faces should be provided.

If two or more right-turn lanes are provided for a separately-controlled right-turn movement, or if a right-turn movement represents the major movement from an approach, two right-turn signal faces should be provided.

Near-side signal faces should be located as near as practicable to the stop line.

If a signal face controls a specific lane or lanes of approach, its position should make it readily visible to road users making that movement.

Supplemental signal faces should be used if an engineering study has shown that they are needed to achieve visibility both in advance and immediately before the signalized location. If supplemental signal faces are used, they should be located to provide optimum visibility for the movement to be controlled.

At signalized mid-block crosswalks, at least one of the signal faces should be over the traveled roadway for each approach.

Option: If a sign is erected to warn approaching road users who do not have a continuous view of at least one signal indication for the minimum sight distance, the sign may be supplemented by a warning beacon. (See Section 4J.2.)

A warning beacon used in this manner may be interconnected with the traffic signal controller assembly in such a manner as to flash yellow during the period when road users passing this beacon at the legal speed for the roadway, may encounter a red indication upon arrival at the signalized location.

4D.16 Number and Arrangement of Sections in Signal Faces

Standard:

Each signal face shall have not more than five signal sections.

Each signal face shall have at least three signal sections except under the following circumstances:

a. If pedestrian signal indications are present.

b. A single-section signal face consisting of a continuously illuminated GREEN ARROW lens that is being used to indicate a continuous movement.

c. A dual arrow signal section that is being used to display a GREEN ARROW and a YELLOW ARROW indication alternately.

d. A signal face used for a ramp control signal.

Arrows shall be pointed

a. Vertically upward to indicate a straight-through traffic movement.

b. Horizontally in the direction of the turn to indicate a turn at approximately or greater than a right angle.

c. Upward with a slope at an angle approximately equal to that of the turn if the angle of the turn is substantially less than a right angle.

The lenses in a signal face shall be arranged in a vertical or horizontal straight line, except that in a vertical array, lenses of the same color may be arranged horizontally adjacent to each other at right angles to the basic straight line arrangement. Such clusters shall be limited to two identical lenses or to two or three different lenses of the same color.

In each signal face, all red lenses in vertical faces shall be located above, and in horizontal faces shall be located to the left, of all yellow and green lenses.

A yellow lens shall be located between the red lens or lenses and all other lenses.

In vertically-arranged signal faces, each YELLOW ARROW lens shall be located immediately above the GREEN ARROW lens to which it applies. If a variable-indication signal section is used, the lens shall be in the same position relative to other lenses as are the GREEN ARROW lenses in a vertical signal face.

In horizontally-arranged signal faces, the YELLOW ARROW lens shall be located immediately to the left of the GREEN ARROW lens. If a variable-indication signal section is used, the variable left-turn arrow lens shall be located immediately to the right of the CIRCULAR YELLOW lens, the straight-through GREEN ARROW lens shall be located immediately to the right of the CIRCULAR GREEN lens, and the variable right-turn arrow lens shall be located to the right of all other lenses.

The relative positions of lenses within the signal face shall be as follows:

a. In a vertical signal face from top to bottom:
CIRCULAR RED
CIRCULAR YELLOW
CIRCULAR GREEN
Straight-through GREEN ARROW
Left-turn YELLOW ARROW
Left-turn GREEN ARROW
Right-turn YELLOW ARROW
Right-turn GREEN ARROW

b. In a horizontal signal face from left to right:
CIRCULAR RED
CIRCULAR YELLOW
Left-turn YELLOW ARROW
Left-turn GREEN ARROW
CIRCULAR GREEN
Straight-through GREEN ARROW
Right-turn YELLOW ARROW
Right-turn GREEN ARROW

c. If adjacent indications in a cluster are not identical, their arrangement shall follow paragraph a or b above, as applicable.

Option: In a vertical array cluster, identical signal indications may be repeated in adjacent horizontal locations within the same signal face.

Horizontal and vertical signal faces may be used on the same approach provided they are separated to meet the lateral clearance required in Section 4D.15.

Three hundred millimeter (12 in) lenses should be used for all signal indications for the following:

a. Approaches with 85th-percentile approach speeds exceeding 65 km/h (40 mph).

b. Approaches where a traffic control signal might be unexpected.

c. Arrows.

d. All approaches without curbs and gutters where only signal heads mounted on post are used.

Support:

Figure 4–7 illustrates some of the possible arrangements of lenses in signal faces.

Standard:

Three-hundred millimeter (12-in) lenses shall be used:

a. For signal indications for approaches (see definition in Section 4A.6) where road users view both traffic control and lane-use control signal heads simultaneously.

b. If the nearest signal face is between 35 m (120 ft) and 45 m (150 ft) beyond the stop line, unless a supplemental near-side signal indication is provided.

c. When signal faces are located more than 45 meters (150 feet) from the stop line.

d. For approaches to all signalized locations for which the minimum visibility distance in Table 4–2 cannot be met.

e. For arrow signal sections.

Support:

The use of 300 mm (12-in) lenses or higher intensity 200 mm (8-in) lenses can be used to assist older drivers in decision-making tasks further from the intersection where traffic density is lower and there are fewer potential conflicts with other vehicles.

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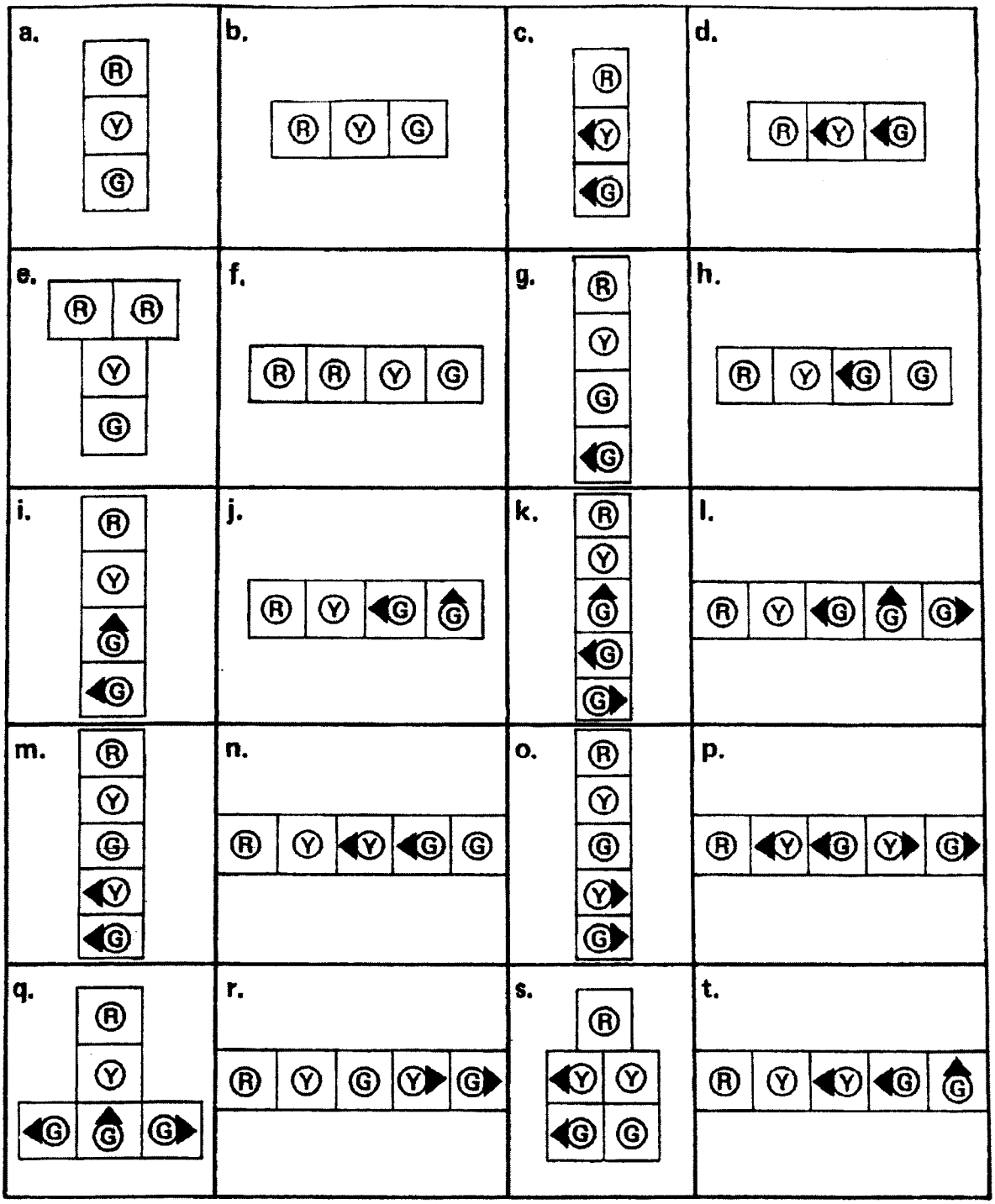

Figure 4-7. Typical arrangements of lenses in signal faces.

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4D.17 Visibility, Shielding, and Positioning of Signal Faces

Standard:

The primary consideration in signal face placement and adjustment shall be to optimize the signals visibility to approaching traffic. Road users approaching a signalized intersection or other signalized area, such as a mid-block crosswalk, shall be given a clear and unmistakable indication of their right-of-way assignment.

The geometry of each intersection to be signalized, including vertical grades, horizontal curves, and obstructions as well as the lateral and vertical angles of sight toward a signal face, as determined by typical driver-eye position, shall be considered in determining the vertical, longitudinal, and lateral position of the signal face.

If the sight distance to the signal heads facing the approach is limited by horizontal or vertical alignment, the signal faces shall be aimed at a point on the approach at which the signal indication first becomes visible.

In cases where irregular intersection geometric design necessitates placing signal faces for different roadway approaches with a comparatively small angle between their respective lenses, each signal lens shall, to the extent practicable, be shielded or directed by signal visors, louvers, or other means so that an approaching road user can see only the lens(es) controlling movements on the road user's approach.

The bottom of the signal housing and any related attachments to a vehicle face located over a roadway shall be at least 4.6 meters (15 feet) above the pavement. The top of the signal housing of a vehicle signal face located over a roadway shall not be more than 7.8 meters (25.6 feet) above the pavement.

Signal visors exceeding 300 mm (12 in) in length shall not be used on free-swinging signal heads.

The bottom of the housing of a vehicle signal face mounted or suspended over a roadway shall be at least 4.6 meters (15 feet) but not more than 5.8 meters (19 feet) above the pavement.

The bottom of the signal housing of a vehicle signal face, not mounted or suspended over a roadway.

a. Shall be at least 2.5 m (8 ft) but not more than 5.8 m (19 ft) above the sidewalk or, if there is no sidewalk, above the pavement grade at the center of the roadway.

b. Shall be at least 1.4 m (4.5 ft) but not more than 5.8 m (19 ft) above the median island grade of a center median island if located on the near side of the intersection.

Supports for post-mounted signal heads at the side of a roadway with curbs shall have a horizontal clearance of not less than 0.6 m (2 ft) from the face of a vertical curb.

If there is no curb, supports for post-mounted signal heads shall have a horizontal clearance of not less than 0.6 m (2 ft) from the edge of a shoulder.

Guidance:

On medians, the above minimum clearances for signal supports should be obtained if practicable.

There should be legal authority to prohibit the display of any unauthorized sign, signal, marking, or device that interferes with the effectiveness of any official traffic control device. Specific reference is made to Section 11–205, Uniform Vehicle Code (latest edition).

In the interest of safety:

a. Reference should be made to the American Association of State Highway and Transportation Officials (AASHTO) Roadside Design Guide.

b. Signal supports should be placed as far as practicable from the edge of the traveled way without adversely affecting the visibility of the signal indications.

Where supports cannot be located with the required clearances, consideration should be given to the use of breakaway designs or guard shielding barriers.

No part of a concrete base for a signal support should extend more than 100 mm (4 in) above the ground level at any point. This limitation does not apply to the concrete base for a rigid (non-breakaway) support.

c. A signal support or controller cabinet should not obstruct the sidewalk, or access from the sidewalk to the crosswalk.

d. Controller cabinets should be located as far as practicable from the edge of the roadway.

Signal visors should be used on signal faces to aid in directing the signal indication specifically to approaching traffic, as well as to reduce ''sun phantom'' which results when external light enters the lens.

In general, vehicular signal faces should be aimed so that the continuation of the optical axis of the signal sections passes through a point on the approach that is located at least the minimum sight distance from the stop line and at driver's eye height.

A backplate for target value enhancement should be used on signal faces viewed against bright sky or bright or confusing backgrounds.

Support:

The use of back-plates of a size (width) three times the diameter of the signal can be used to assist older drivers in decision-making tasks further from an intersection where the traffic density is lower and there are fewer potential conflicts with other vehicles. The use of back-plates also enhances the contrast between the traffic signals and their surroundings for both daytime and nighttime conditions.

Option: In some instances road users may be misdirected when two different signal indications on different signal faces are simultaneously visible. In these instances, a visibility-limited signal face may be used.

4E.4 Size, Design, and Illumination of Pedestrian Signal Head Indications

Standard:

All new pedestrian signal head indications shall be displayed within a rectangular background and shall consist of symbolized messages. Symbol designs are set forth in the Standard Highway Signs. Existing pedestrian signal head indications with lettered messages may be retained for the remainder of their useful service life. Each indication shall be independently illuminated and emit a single color. (See Figure 4–8.)

The DON'T WALK signal section shall be mounted directly above or integral with the WALK signal section.

The WALK indication shall be white, conforming to the document entitled Pedestrian Traffic Control Signal Indications[1], with all except the symbols obscured by an opaque material.

The DON'T WALK indication shall be Portland orange conforming to the Pedestrian Traffic Control Signal Indications[2], with all except the symbols obscured by an opaque material.

When not illuminated, the WALK and DON'T WALK symbols shall not be readily visible to pedestrians at the far end of the crosswalk that the signal head indications control.

Guidance:

Pedestrian signal head indications should be conspicuous and recognizable to pedestrians at all distances from the beginning of the controlled crosswalk to a point 3 m (10 ft) from the end of the controlled crosswalk during both day and night.

For crosswalks where the pedestrian enters the crosswalk more than 30 m (100 ft) from the pedestrian signal head

[1] Available in, ''Equipment and Material Standards of the Institute of Transportation Engineers,'' see Preface.

[2] Ibid.

indications, the symbols should be at least 225 mm (9 in) high.

For pedestrian signal head indications, the symbols shall be at least 150 mm (6 in) high.

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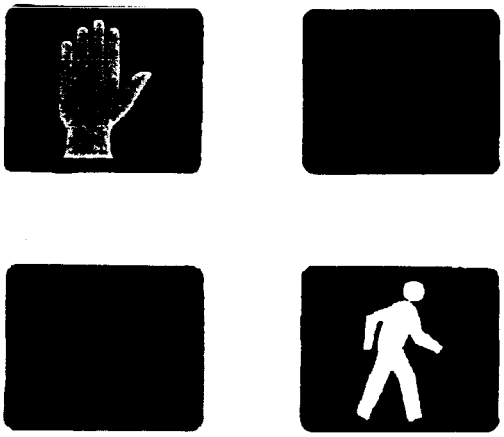
Single Section



Two Section

Figure 4-8. Typical pedestrian signal indications.
(Hands are in Orange, Walking People are in White)

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4E6. Accessible Pedestrian Signals

Support:

The primary technique that people who have visual disabilities use to cross streets at signalized locations is to initiate their crossing when they hear the traffic alongside them begin to move, corresponding to the onset of the green interval. The effectiveness of this technique is reduced by several factors including: increasingly quiet cars, right turn on red (which masks the beginning of the through phase), complex signal operations, and wide streets. Further, low traffic volumes make it difficult for pedestrians who have visual disabilities to discern signal phase changes.

Local organizations providing support services to pedestrians who have visual and/or hearing disabilities can often act as advisors to the engineer when consideration is being given to the installation of devices to assist such pedestrians. Orientation and mobility specialist or similar staff might be able to provide a wide range of advice. Information might range from assessing the needs of a single individual to commenting on the operation of proposed devices. [3]

Standard:

When used, accessible pedestrian signals (see Section 4D.3) which provide information in non-visual format (including audible tones, verbal messages, and/or vibrotactile information), shall be used in combination with pedestrian signal timing. Accessible pedestrian signals shall clearly indicate the direction of the pedestrian crossing served by devices, such as the tactile arrows.

Under stop-and-go operations, accessible pedestrian signals shall not be limited in operation by the time of day or day of week.

Guidance:

The installation of accessible pedestrian signals at signalized intersections should be based on an engineering study, which should consider the following factors:

a. Potential demand for accessible pedestrian signals.

b. A request for accessible pedestrian signals.

c. Traffic volumes during times when pedestrians might be present; including periods of low traffic volumes or high turn-on-red volumes.

d. The complexity of traffic signal phasing.

e. The complexity of intersection geometry.

Support:

Technology that provides different sounds for each non-concurrent signal phase has frequently been found to provide ambiguous information.

Standard:

When choosing audible tones, possible extraneous sources of sounds (such as wind, rain, vehicle back-up warnings, or birds) shall be considered in order to eliminate potential confusion to pedestrians who have visual disabilities.

Guidance:

Audible pedestrian tones should be carefully selected to avoid misleading pedestrians who have visual disabilities when the following conditions exist:

a. Where there is an island that allows unsignalized right turns across a crosswalk between the island and the sidewalk.

b. Where multi-leg approaches or complex signal phasing require more than two pedestrian phases, such that it may be unclear which crosswalk is served by each audible tone.

c. At intersections where a diagonal pedestrian crossing is allowed, or where one street receives a WALK indication simultaneously with another street.

Standard:

When accessible pedestrian signals have an audible tone(s), they shall have a tone for the WALK interval. The WALK interval tone shall have a faster repetition rate than the associated pushbutton locator tone. The audible tone(s) shall be audible from the beginning of the associated crosswalk.

Support:

A pushbutton locator tone is a repeating sound that informs approaching pedestrians that they are required to push a botton to actuate a WALK signal and that enables pedestrians who have visual disabilities to locate the pushbutton. (See Section 4E.8)

Guidance:

The accessible WALK signal tone should be no louder than the locator tone, except when there is optional activation to provide a louder signal tone for a signal pedestrian phase. (See Section 4.E.8)

Automatic volume adjustment in response to ambient traffic sound level should be provided up to a maximum volume of 89dB. [4] Where automatic volume adjustment is used, tones should be no more than 5dB louder than ambient sound.

Standard:

When verbal messages are used to communicate the pedestrian interval, they shall provide a clear message that the WALK interval is in effect, as well as to which crossing it applies.

The verbal messages that is provided at regular intervals throughout the timing of the WALK interval shall be the term 'walk sign,'' which may be followed by the name of the street to be crossed.

A verbal message is not required at times when the WALK interval is not timing, but, if provided:

a. It shall be the term ''wait.''

b. It need not be repeated for the entire time that the WALK interval is not timing.

Option: Accessible pedestrian signals that provide verbal messages may provide similar messages in languages other than English, if needed, except for the terms ''walk sign'' and ''wait.''

Standard:

A vibrotactile pedestrian device communicates information about pedestrian signal phasing through a vibrating surface by touch. Vibrotactile pedestrian devices, where used, shall indicate that the WALK interval is in effect, and for which direction it applies, through the use of a vibrating directional arrow or some other means.

Guidance:

When provided, vibrotactile pedestrians devices should be located next to, and on the same pole as, the pedestrian pushbuttom, if any, and adjacent to the intended crosswalk.

4E.8 Accessible Pedestrian Signal Detectors

Standard:

At accessible pedestrian signal locations with pedestrian actuation, each pushbutton shall activate both the WALK interval and the accessible pedestrian signals.

Guidance:

At accessible pedestrian signal locations, pushbuttons should clearly indicate which crosswalk signal is actuated by each pushbutton. Pushbuttons and tactile arrows should

[3] For guidance relative to techniques for making pedestrian signal information accessible to persons with visual impairment, including directly audible tones, transmitted speech messages, and vibration, refer to U.S. Access Board Document A–37b ''Accessible pedestrian Signals'' and the Federal Highway Administration.

[4] *Measurement of Highway-Related Noise*, FHWA–PD–96–046, DOT–UNTSC–FHWA–96–5. Available through the National Technical Information Service, see Preface.

have high visual contrast.[5] Tactile arrows should point in the same direction as the associated crosswalk. At corners of signalized locations with accessible pedestrian signals where two pedestrian pushbuttons are provided, the pushbuttons should be separated by a distance of at least 3 meters (10 feet). This enables pedestrians who have visual disabilities to distinguish and locate the appropriate pushbutton.

Pushbuttons for accessible pedestrian signals should be located as follows:

a. Adjacent to a level all-weather surface to provide access from a wheelchair, and where there is an all-weather surface, wheelchair route to the ramp.

b. Within 1.5 meters (5 feet) of the crosswalk extended.

c. Within 3 meters (10 feet) of the edge of the curb, shoulder, or pavement.

[5] See Department of Justice Americans with Disabilities Act Standards for Accessible Design.

d. Parallel to the crosswalk to be used (see Figure 4–9).

If the pedestrian clearance time is sufficient only to cross from the curb or shoulder to a median of sufficient width for pedestrians to wait *and* accessible pedestrian detectors are used, an additional accessible pedestrian detector should be provided in the median.

Standard:

Pushbutton locator tones shall be highly locatable and shall repeal at one-second intervals.

Guidance:

Pushbuttons should be audible locatable. Pushbutton locator tones should be intensity responsive to ambient sound, and be audible 2 to 4 meters (6 to 12 feet) from the pushbutton, or to the building line, whichever is less. Pushbutton locator tones should be no more than 5 dB louder than ambient sound.

Pushbutton locator tones should be deactivated during flashing operation of the traffic control signal.

Option: At locations with pre-timed traffic signals or non-actuated approaches, pedestrian pushbuttons may be used to activate the accessible pedestrian signals.

The audible tone(s) may be made louder (up to a maximum of 89dB) by holding down the pushbutton for a minimum of 3 seconds. The louder audible tone(s) may also alternate back and forth across the crosswalk, thus providing optimal directional information.

The name of the street to be crossed may also be provided in accessible format, such as braille, or raised print.

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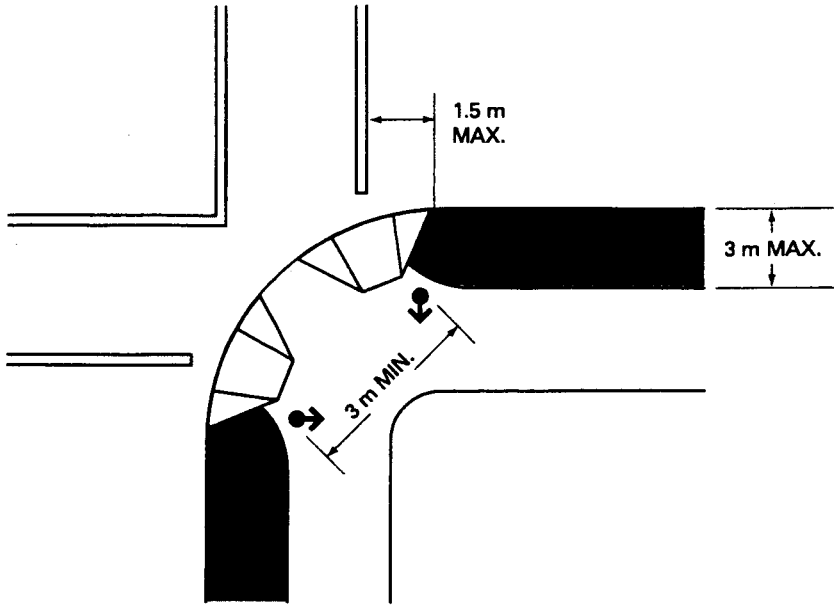
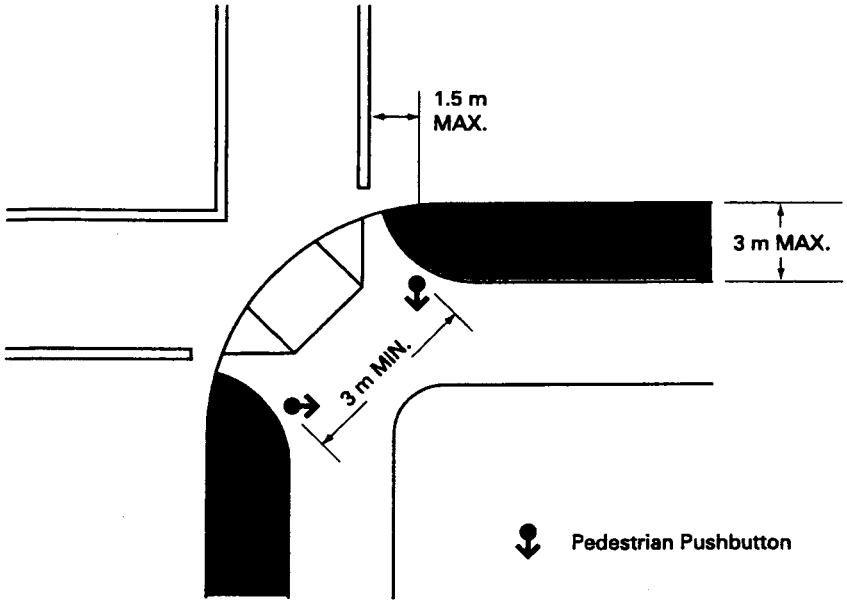


Two Curb



One Curb

Figure 4-9. Recommended Pushbutton Locations

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4E.9 Pedestrian Intervals and Phases

Standard:

When pedestrian signal heads are used, a WALK indication shall be displayed only when pedestrians are permitted to leave the curb or shoulder.

A pedestrian clearance time shall begin immediately following the WALK indication. The pedestrian clearance time shall consist of a pedestrian change interval during which a flashing DON'T WALK indication shall be displayed.

At intersections equipped with pedestrian signals, the pedestrian signal indications shall be displayed except when the vehicular traffic control signal is being operated as a flashing device. At those times, the pedestrian signal indications shall not be displayed.

Guidance:

The walk interval should be at least 7 seconds in length so that pedestrians will have adequate opportunity to leave the curb or shoulder before the pedestrian clearance time begins.

The pedestrian clearance time should be sufficient to allow a pedestrian crossing in the crosswalk to leave the curb or shoulder and travel at a normal walking speed of 1.2m (4 feet) per second, to at least the far side of the farthest traveled lane or to a median of sufficient width for a pedestrian to wait. Where significant numbers of pedestrians who walk slower than normal routinely use the crosswalk, a walking speed of less than 1.2 (4 feet) per second should be considered in determining the pedestrian clearance time.

Option: An alternative to using a lower walking speed to determine the pedestrian clearance time is to employ the use of passive pedestrian detection equipment in the crosswalks. Such equipment can detect pedestrians who need more time to complete their crossing. The equipment extends the length of the pedestrian clearance time for that cycle to allow pedestrians to complete their crossing before cross traffic begins.

Guidance:

Where the pedestrian clearance time is sufficient only for crossing from the curb or shoulder to the median, additional measures should be considered, such as median-mounted pedestrian signals, staggered crosswalks, or additional signing.

Option: Pedestrian clearance time may include the yellow change interval, if used, and the red clearance interval, if used.

If pedestrian volumes and characteristics do not require a 7-second walk interval, walk intervals as short as 4 seconds may be used.

On a roadway with a median of sufficient width for pedestrians to wait, a pedestrian clearance time that allows the pedestrian to cross only from the curb or shoulder to the median may be provided.

During the transition into preemption, the walk interval and the pedestrian change interval may be shortened or omitted as described in Sections 4D.13 and 8C.6.

Support:

The walk interval itself need not equal or exceed the pedestrian clearance time calculated for the roadway width, because many pedestrians will complete their crossing during the pedestrian clearance time.

4J.3 Design of Lane-use Control Signals

Standard:

All lane-use control signal indications shall be in units with rectangular signal faces and shall have opaque backgrounds. Nominal minimum height and width of each downward GREEN ARROW, YELLOW X, and RED X signal face shall be 450 mm (18 inches) for typical applications. The WHITE two-way and one-way left-turn ARROW signal indications shall have a nominal minimum height and width of 750 mm (30 inches).

Each lane to be reversed or closed shall have signal faces with a downward GREEN ARROW and a RED X symbol.

Each reversible lane that also operates as a two-way or one-way left-turn lane during certain periods shall have signal faces that also include the applicable WHITE two-way or one-way left-turn ARROW symbol.

Each nonreversible lane immediately adjacent to a reversible lane shall have signal indications that display a downward GREEN ARROW to traffic traveling in the permitted direction and a RED X to traffic traveling in the opposite direction.

If in separate units, the relative positions, from left to right, of the indications shall be RED X, YELLOW X, downward GREEN ARROW, two-way left-turn ARROW, one-way left-turn ARROW.

The color of lane-use control signal indications shall be clearly visible for 700 m (2300 ft) at all times under normal atmospheric conditions, unless otherwise physically obstructed.

Lane-use control signal units shall be located approximately over the center of the lane controlled.

If the area to be controlled is more than 700 m (2300 ft) in length, or if the vertical or horizontal alignment is curved, intermediate lane-use control signal indications shall be placed over each controlled lane at frequent intervals. This placement shall be such that road users will at all times be able to see at least one indication and preferably two along the roadway, and will have a definite indication of the lanes specifically reserved for their use.

All lane-use control signal faces shall be located in a straight line across the roadway approximately at right angles to the roadway alignment.

The bottom of any lane-use control signal unit shall be at least 4.6 m (15 ft) but not more than 5.8 m (19 ft) above the pavement grade.

On roadways having intersections controlled by traffic control signals, the lane-use control indication shall be placed sufficiently far in advance of or beyond such traffic control signals to prevent them from being misconstrued as traffic control signals.

Guidance:

In highly-developed commercial environments, signal faces with nominal height and width of 450 mm (18 in) or larger should be considered for additional target value.

Option: In areas with minimal visual clutter and with speeds of 70 km/h (40 mph) or less, lane-use control signal faces with nominal height and width of 300 mm (12 inches) may be used.

Other sizes of lane-use control signal faces with message recognition distances appropriate to signal spacing may be employed for unusual applications.

Signal faces with a YELLOW X symbol on an opaque background may be provided for operation as described in Section 4J.4.

Nonreversible lanes not immediately adjacent to a reversible lane on any street so controlled may also be provided with signal indications that display a downward GREEN ARROW to traffic traveling in the permitted direction and a RED X to traffic traveling in the opposite direction.

The indications provided for each lane may be in separate units or may be superimposed in the same unit.

4L IN–ROADWAY LIGHTS

4L.1 Application of In-Roadway Lights

Support:

In-Roadway Lights are special types of highway traffic signals installed in the roadway surface to warn road users that they are approaching a condition on or adjacent to the roadway that might not be readily apparent and might require the road users to slow down and

possibly come to a stop. This includes, but is not necessarily limited to, situations warning of marked school crosswalks, marked mid-block crosswalks, marked crosswalks on uncontrolled approaches, and other roadway situations involving pedestrian crossings.

Standard:

In-Roadway Lights shall not exceed a height of 20 millimeters (¾ inches) above the roadway surface.

Option: The flash rate for In-Roadway Light may be different than the flash rate of standard beacons.

4L.2 In-Roadway Warning Lights at Crosswalks

Standard:

In-Roadway Warning Lights at crosswalks shall be installed only at marked crosswalks with applicable warning signs. They shall not be used at crosswalks controlled by YIELD signs, STOP signs or traffic control signals.

In-Roadway Warning Lights at crosswalks shall be installed along both sides of the crosswalk and shall span its entire length.

In-Roadway Warning Lights at crosswalks shall initiate operation based on pedestrian actuation and shall cease operation at a predetermined time after the pedestrian actuation or with passive detection after the pedestrian clears the crosswalk.

In-Roadway Warning Lights at crosswalks shall display a flashing yellow indication when actuated. The flash rate for In-Roadway Warning Lights at crosswalks shall be at least 50 flash periods per minute. The flash rate shall not be between 5–30 flashes per second to avoid frequencies that might cause seizures.

For one-lane, one-way roadways, a minimum of two In-Roadway Warning Lights shall be installed on the approach side of the crosswalk. For two-lane roadways, a minimum of three In-Roadway Warning Lights shall be installed along both sides of the crosswalk. For roadways with more than two lanes, a minimum of one In-Roadway Light per lane shall be installed along both sides of the crosswalk.

In-Roadway Warning Lights shall be installed within 3 meters (10 feet) of the outside edge of the crosswalk. In-Roadway Warning Lights shall face away from the crosswalk if uni-directional, or shall face away from and across the crosswalk if bi-directional.

Guidance:

The period of operation of the In-Roadway Warning Lights following each actuation should be sufficient to allow a pedestrian crossing in the crosswalk to start crossing the traveled way and travel at a normal walking speed of 1.2 meters (4 feet) per second to at least the far side of the traveled way or to a median of sufficient width for pedestrians to wait. Where significant numbers of pedestrians who walk slower than normal routinely use the crosswalk, a walking speed of less than 1.2 m (4 feet) per second should be considered in determining the period of operation.

Where the period of operation is sufficient only for crossing from a curb or shoulder to a median of sufficient width for pedestrians to wait, additional measures should be considered, such as median-mounted pedestrian actuators.

The location of the In-Roadway Warning Lights within the lanes should be based on engineering judgment.

Option: On one-way streets, In-Roadway Warning Lights may be omitted on the departure side of the crosswalk.

Based on engineering judgment, the In-Roadway Warning Lights on the departure side of the crosswalk on the left side of a median may be omitted.

In-Roadway Warning Lights may be installed in the center of each travel lane, at the centerline of the roadway, at each edge of the roadway or parking lanes, or at other suitable locations.

Unidirectional In-Roadway Warning Lights installed at crosswalk locations may have a yellow light indication in each unit that is visible to pedestrians in the crosswalk. These lights may flash with and at the same flash rate as the light head in which each is installed.

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DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

23 CFR Part 945

[FHWA Docket No. FHWA 99–5844]

RIN 2125–AE63

Dedicated Short Range Communications In Intelligent Transportation Systems (ITS) Commercial Vehicle Operations

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Notice of proposed rulemaking (NPRM); request for comments.

SUMMARY: The FHWA proposes to amend its regulations to require use of the FHWA Specification for ''Dedicated Short Range Communications (DSRC) for Commercial Vehicles'' as a provisional standard for Intelligent Transportation Systems (ITS) commercial vehicle projects using highway trust funds. The DSRC systems use microwave communications over very short distances to allow moving vehicles to communicate with roadside locations. In commercial vehicle applications, the DSRC devices provide identification of vehicles which allows electronic screening of the vehicle, for safety, regulatory compliance, and credentials at weigh stations, ports of entry, and international border crossings. The use of DSRC standards would promote interoperability among, and enable integration of the ITS systems for North American commercial vehicle applications. Interoperability provided by this provisional standard would also encourage business interoperability and cooperation.

DATES: Comments must be received on or before February 28, 2000.

ADDRESSES: Submit written, signed comments to the docket number that appears in the heading of this document to the Docket Clerk, U.S. DOT Dockets, Room PL–401, 400 Seventh Street, SW., Washington, DC 20590–0001. All comments received will be available for examination at the above address from 9 a.m. to 5 p.m., e.t., Monday through Friday, except Federal holidays. Those desiring notification of receipt of comments must include a self-addressed, stamped envelope or postcard.

FOR FURTHER INFORMATION CONTACT: Mr. William S. Jones, ITS Joint Program Office (JPO), (202) 366–2128, e-mail address <william.s.jones@fhwa.dot.gov>; or Mr. Wilbert Baccus, Office of the Chief Counsel, (HCC–32) (202) 366–0780, e-mail address <wilbert.baccus@fhwa.dot.gov>, Federal Highway Administration, 400 Seventh Street, SW., Washington, DC 20590. Office hours are from 7:30 a.m. to 4 p.m., e.t., Monday through Friday, except Federal holidays.

SUPPLEMENTARY INFORMATION:

Electronic Access

Internet users may access all comments received by the U.S. DOT Dockets, Room PL–401, by using the universal resource locator (URL): *http://dms.dot.gov*. It is available 24 hours each day, 365 days each year. Please follow the instructions online for more information and help.

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