



California Traffic Control Devices Committee Agenda Item Report



Meeting Date: February 02, 2023	From: John Bamfield, PE, Caltrans
Item Number: 22-12	
Sponsored By: Yue Wang, PE, Caltrans	Presented By: John Bamfield, PE, Caltrans
Description: 2009 National Manual on Uniform Traffic Control Devices (MUTCD) Revision 3 Federal Highway Administration (FHWA) Final Rule on Maintaining Minimum Pavement Marking Retroreflectivity.	

Recommendation:

None.

This is an informational item that is being continued from the previous meeting to make agencies aware of FHWA's issuance of the Final Rule revising National MUTCD 2009 Edition. If agencies have completed their reviews and members are prepared to discuss the details of this National MUTCD 2009 Revision 3, this item can be brought back to the committee as an action item. California has 2 years from the effective date (9/6/2022) to adopt this final rule by incorporation it into California MUTCD (CA MUTCD).

Agency Making Request/Sponsor:

John Bamfield, Caltrans / Yue Wang, CTCDC Member.

Background:

On August 5, 2022 the final rule adopting Revision 3 of the 2009 MUTCD was published by FHWA in the Federal Register with an effective date of September 6, 2022. California has 2 years from the effective date to adopt this final rule by incorporation it into CA MUTCD. This item is being shared to allow agencies the opportunity to review the final rule on maintaining minimum pavement marking retroreflectivity. It is expected that when agencies have completed their reviews and members are prepared to discuss the details of this National MUTCD 2009 Revision 3, this will be brought back to the committee as an action item.

The final rule requires applicable agencies or officials to implement a method for maintaining pavement marking retroreflectivity at or above minimum levels, providing a 4-year compliance date for implementing the method, which for California is July 29, 2026. The purpose of the final rule is to update the 2009 National MUTCD to provide standards, guidance, options, and supporting information relating to maintaining minimum levels of retroreflectivity for pavement markings. The MUTCD is incorporated in FHWA regulations and recognized as the national standard for traffic control devices used on all streets, highways, bikeways, and private roads open to public travel.



California Traffic Control Devices Committee Agenda Item Report



Reducing transportation-related fatalities and serious injuries is a primary goal of FHWA. The purpose of including a minimum retroreflectivity standard in the MUTCD is to advance safety and mobility by assisting with the nighttime visibility needs of drivers. This final rule addresses driver visibility needs in terms of pavement markings. The final rule for maintaining minimum levels of retroreflectivity for traffic signs was issued on December 21, 2007, at 72 FR 72574. Both rules are based on older driver needs with an average age of 62 years. While the minimum retroreflectivity levels in the rule are based on driver needs, the improvement in markings that will result from this rule will also improve the infrastructure's ability to work with advanced driver assistance systems (ADAS) and automated driving systems (ADS).

This final rule establishes minimum maintained retroreflectivity levels for longitudinal pavement markings on all roads open to public travel with speed limits of 35 mph or greater. The final rule requires applicable agencies or officials to implement a method for maintaining pavement marking retroreflectivity at or above minimum levels, providing a 4-year compliance date for implementing the method. It provides options for agencies on roads where illumination or low volumes make the markings less critical and for certain types of markings. It also acknowledges short-term allowances of subminimum retroreflectivity based on special circumstances. As with the current MUTCD requirements for sign retroreflectivity, this final rule does not include compliance dates for replacement of pavement markings that do not meet minimum retroreflectivity levels. Pavement marking replacement schedules will be based on the methods established by agencies or officials.

For further information on the final rule, see the link below to the Federal Register:

<https://www.federalregister.gov/documents/2022/08/05/2022-16781/national-standards-for-traffic-control-devices-the-manual-on-uniform-traffic-control-devices-for>

For further information on 2009 National MUTCD Revision 3, see the links below:

https://mutcd.fhwa.dot.gov/pdfs/2009r1r2r3/pdf_index.htm
<https://mutcd.fhwa.dot.gov/pdfs/2009r1r2r3/mutcd2009r2r3pages.pdf>

Attachments:

Attachment – 2009 National MUTCD Revision 3 Excerpts.



ATTACHMENT

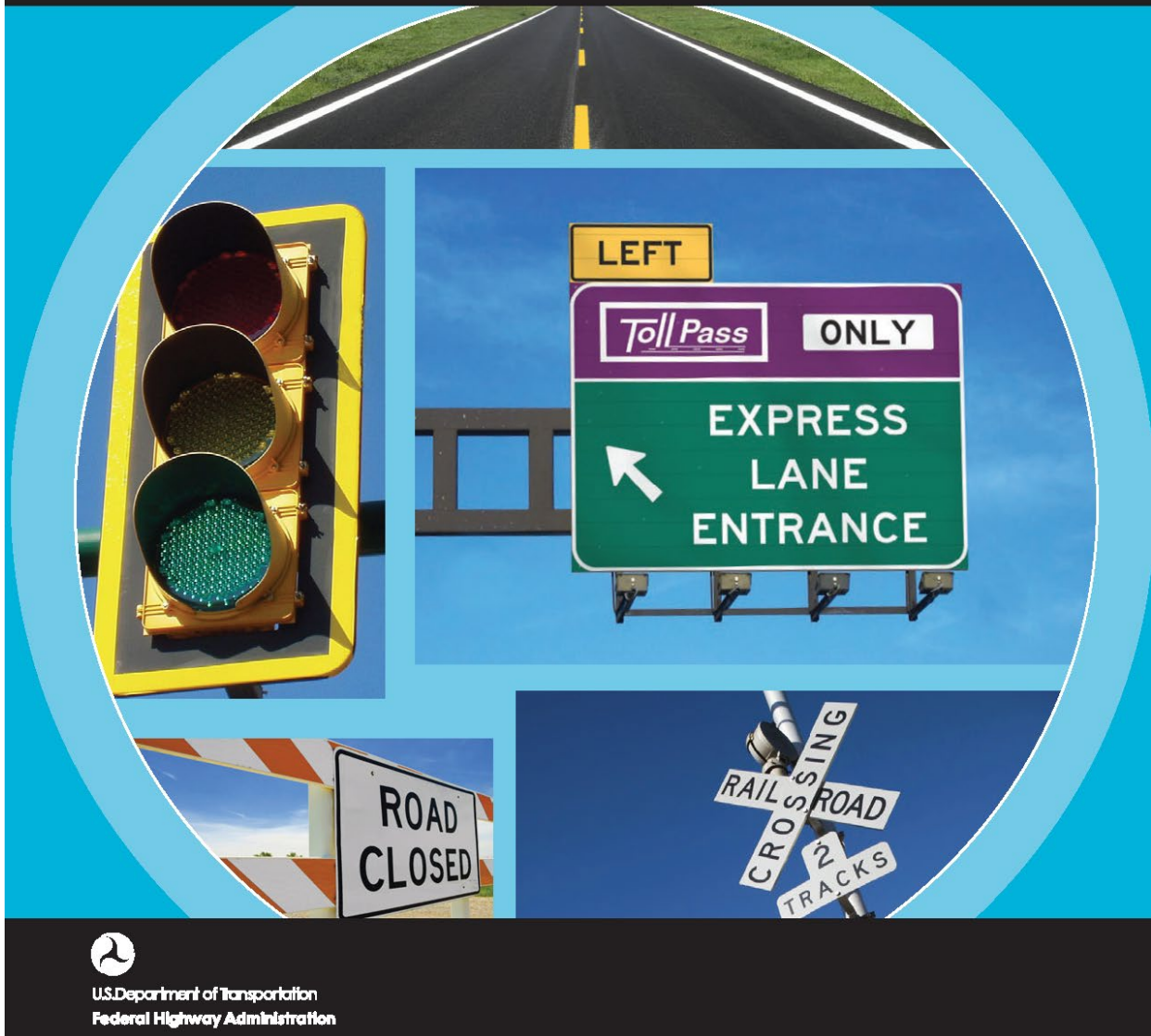
Attachment – 2009 National MUTCD Revision 3 Excerpts.

Manual on Uniform Traffic Control Devices

for Streets and Highways

2009 Edition

Including Revision 1 dated May 2012
Revision 2 dated May 2012
and Revision 3 dated July 2022



U.S. Department of Transportation
Federal Highway Administration



**Manual on Uniform
Traffic Control Devices**

**2009
Edition**

Including Revision 1 dated May 2012
Revision 2 dated May 2012
and Revision 3 dated July 2022



California Traffic Control Devices Committee Agenda Item Report



2009 Edition - Revision 3

Page TC-9

PART 3. MARKINGS

CHAPTER 3A. GENERAL

Section 3A.01	Functions and Limitations.....	347
Section 3A.02	Standardization of Application	347
Section 3A.03	Maintaining Minimum Pavement Marking Retroreflectivity	347
Section 3A.04	Materials	348
Section 3A.05	Colors	348
Section 3A.06	Functions, Widths, and Patterns of Longitudinal Pavement Markings	349

CHAPTER 3B. PAVEMENT AND CURB MARKINGS

Section 3B.01	Yellow Center Line Pavement Markings and Warrants	350
Section 3B.02	No-Passing Zone Pavement Markings and Warrants	353
Section 3B.03	Other Yellow Longitudinal Pavement Markings.....	355
Section 3B.04	White Lane Line Pavement Markings and Warrants	357
Section 3B.05	Other White Longitudinal Pavement Markings	372
Section 3B.06	Edge Line Pavement Markings	372
Section 3B.07	Warrants for Use of Edge Lines	372
Section 3B.08	Extensions Through Intersections or Interchanges	372
Section 3B.09	Lane-Reduction Transition Markings	375
Section 3B.10	Approach Markings for Obstructions.....	377
Section 3B.11	Raised Pavement Markers – General	377
Section 3B.12	Raised Pavement Markers as Vehicle Positioning Guides with Other Longitudinal Markings	380
Section 3B.13	Raised Pavement Markers Supplementing Other Markings.....	380
Section 3B.14	Raised Pavement Markers Substituting for Pavement Markings.....	381
Section 3B.15	Transverse Markings.....	382
Section 3B.16	Stop and Yield Lines	382
Section 3B.17	Do Not Block Intersection Markings	383
Section 3B.18	Crosswalk Markings	384
Section 3B.19	Parking Space Markings	386
Section 3B.20	Pavement Word, Symbol, and Arrow Markings.....	388
Section 3B.21	Speed Measurement Markings.....	394
Section 3B.22	Speed Reduction Markings	394
Section 3B.23	Curb Markings	395
Section 3B.24	Chevron and Diagonal Crosshatch Markings.....	396
Section 3B.25	Speed Hump Markings	396
Section 3B.26	Advance Speed Hump Markings	396

CHAPTER 3C. ROUNDABOUT MARKINGS

Section 3C.01	General.....	400
Section 3C.02	White Lane Line Pavement Markings for Roundabouts.....	414
Section 3C.03	Edge Line Pavement Markings for Roundabout Circulatory Roadways	414
Section 3C.04	Yield Lines for Roundabouts.....	414
Section 3C.05	Crosswalk Markings at Roundabouts.....	414
Section 3C.06	Word, Symbol, and Arrow Pavement Markings for Roundabouts	414
Section 3C.07	Markings for Other Circular Intersections	415

CHAPTER 3D. MARKINGS FOR PREFERENTIAL LANES

Section 3D.01	Preferential Lane Word and Symbol Markings.....	416
Section 3D.02	Preferential Lane Longitudinal Markings for Motor Vehicles	417

CHAPTER 3E. MARKINGS FOR TOLL PLAZAS

Section 3E.01	Markings for Toll Plazas	424
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Rev. 3

July 2022

Table I-2. Target Compliance Dates Established by the FHWA

	2009 MUTCD Section Number(s)	2009 MUTCD Section Title	Specific Provision	Compliance Date
Rev. 2	2A.08	Maintaining Minimum Retroreflectivity	Implementation and continued use of an assessment or management method that is designed to maintain regulatory and warning sign retroreflectivity at or above the established minimum levels (see Paragraph 2)	June 13, 2014*
	2A.19	Lateral Offset	Crashworthiness of sign supports on roads with posted speed limit of 50 mph or higher (see Paragraph 2)	January 17, 2013 (date established in the 2000 MUTCD)
	2B.40	ONE WAY Signs (R6-1, R6-2)	New requirements in the 2009 MUTCD for the number and locations of ONE WAY signs (see Paragraphs 4, 9, and 10)	December 31, 2019
	2C.06 through 2C.14	Horizontal Alignment Warning Signs	Revised requirements in the 2009 MUTCD regarding the use of various horizontal alignment signs (see Table 2C-5)	December 31, 2019
	2E.31, 2E.33, and 2E.36	Plaques for Left-Hand Exits	New requirement in the 2009 MUTCD to use E1-5aP and E1-5bP plaques for left-hand exits	December 31, 2014
Rev. 3	3A.03	Maintaining Minimum Retroreflectivity	Implementation and continued use of a method that is designed to maintain retroreflectivity of longitudinal pavement markings (see Paragraph 1)	4 years from the effective date of this revision of the MUTCD
	4D.26	Yellow Change and Red Clearance Intervals	New requirement in the 2009 MUTCD that durations of yellow change and red clearance intervals shall be determined using engineering practices (see Paragraphs 3 and 6)	June 13, 2014, or when timing adjustments are made to the individual intersection and/or corridor, whichever occurs first
	4E.06	Pedestrian Intervals and Signal Phases	New requirement in the 2009 MUTCD that the pedestrian change interval shall not extend into the red clearance interval and shall be followed by a buffer interval of at least 3 seconds (see Paragraph 4)	June 13, 2014, or when timing adjustments are made to the individual intersection and/or corridor, whichever occurs first
Rev. 2	6D.03**	Worker Safety Considerations	New requirement in the 2009 MUTCD that all workers within the right-of-way shall wear high-visibility apparel (see Paragraphs 4, 6, and 7)	December 31, 2011
	6E.02**	High-Visibility Safety Apparel	New requirement in the 2009 MUTCD that all flaggers within the right-of-way shall wear high-visibility apparel	December 31, 2011
	7D.04**	Uniform of Adult Crossing Guards	New requirement in the 2009 MUTCD for high-visibility apparel for adult crossing guards	December 31, 2011
	8B.03, 8B.04	Grade Crossing (Crossbuck) Signs and Supports	Retroreflective strip on Crossbuck sign and support (see Paragraph 7 in Section 8B.03 and Paragraphs 15 and 18 in Section 8B.04)	December 31, 2019
	8B.04	Crossbuck Assemblies with YIELD or STOP Signs at Passive Grade Crossings	New requirement in the 2009 MUTCD for the use of STOP or YIELD signs with Crossbuck signs at passive grade crossings	December 31, 2019

* Types of signs other than regulatory or warning are to be added to an agency's management or assessment method as resources allow.

** MUTCD requirement is a result of a legislative mandate.

Note: All compliance dates that were previously published in Table I-2 of the 2009 MUTCD and that do not appear in this revised table have been eliminated.

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

1. "AAA School Safety Patrol Operations Manual," 2006 Edition (American Automobile Association—AAA)
2. "A Policy on Geometric Design of Highways and Streets," 2004 Edition (American Association of State Highway and Transportation Officials—AASHTO)
3. "Guide for the Development of Bicycle Facilities," 1999 Edition (AASHTO)
4. "Guide for the Planning, Design, and Operation of Pedestrian Facilities," 2004 Edition (AASHTO)
5. "Guide to Metric Conversion," 1993 Edition (AASHTO)
6. "Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways," 4th Edition/Guide Signs, Part II: Guidelines for Airport Guide Signing/Guide Signs, Part III: List of Control Cities for Use in Guide Signs on Interstate Highways," Item Code: GSGLC-4, 2001 Edition (AASHTO)
7. "Roadside Design Guide," 2006 Edition (AASHTO)
8. "Standard Specifications for Movable Highway Bridges," 1988 Edition (AASHTO)
9. "Traffic Engineering Metric Conversion Folders—Addendum to the Guide to Metric Conversion," 1993 Edition (AASHTO)
10. "2009 AREMA Communications & Signals Manual," (American Railway Engineering & Maintenance-of-Way Association—AREMA)
11. "Changeable Message Sign Operation and Messaging Handbook (FHWA-OP-03-070)," 2004 Edition (Federal Highway Administration—FHWA)
12. "Designing Sidewalks and Trails for Access—Part 2—Best Practices Design Guide (FHWA-EP-01-027)," 2001 Edition (FHWA)
13. "Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes," 2001 (FHWA)
14. "Maintaining Traffic Sign Retroreflectivity," 2007 Edition (FHWA)
15. "Railroad-Highway Grade Crossing Handbook—Revised Second Edition (FHWA-SA-07-010)," 2007 Edition (FHWA)
16. "Ramp Management and Control Handbook (FHWA-HOP-06-001)," 2006 Edition (FHWA)
17. "Roundabouts—An Informational Guide (FHWA-RD-00-067)," 2000 Edition (FHWA)
18. "Signal Timing Manual (FHWA-HOP-08-024)," 2008 Edition (FHWA)
19. "Signalized Intersections: an Informational Guide (FHWA-HRT-04-091)," 2004 Edition (FHWA)
20. "Travel Better, Travel Longer: A Pocket Guide to Improving Traffic Control and Mobility for Our Older Population (FHWA-OP-03-098)," 2003 Edition (FHWA)
21. "Practice for Roadway Lighting," RP-8, 2001 (Illuminating Engineering Society—IES)
22. "Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electric Detonators (Blasting Caps)," Safety Library Publication No. 20, July 2001 Edition (Institute of Makers of Explosives)
23. "American National Standard for High-Visibility Public Safety Vests," (ANSI/ISEA 207-2006), 2006 Edition (International Safety Equipment Association—ISEA)
24. "American National Standard for High-Visibility Safety Apparel and Headwear," (ANSI/ISEA 107-2004), 2004 Edition (ISEA)
25. "Manual of Traffic Signal Design," 1998 Edition (Institute of Transportation Engineers—ITE)
26. "Manual of Transportation Engineering Studies," 1994 Edition (ITE)
27. "Pedestrian Traffic Control Signal Indications," Part 1—1985 Edition; Part 2 (LED Pedestrian Traffic Signal Modules)—2004 Edition (ITE)
28. "Preemption of Traffic Signals Near Railroad Crossings," 2006 Edition (ITE)
29. "Purchase Specification for Flashing and Steady Burn Warning Lights," 1981 Edition (ITE)
30. "Traffic Control Devices Handbook," 2001 Edition (ITE)
31. "Traffic Detector Handbook," 1991 Edition (ITE)
32. "Traffic Engineering Handbook," 2009 Edition (ITE)
33. "Traffic Signal Lamps," 1980 Edition (ITE)
34. "Vehicle Traffic Control Signal Heads," Part 1—1985 Edition; Part 2 (LED Circular Signal Supplement)—2005 Edition; Part 3 (LED Vehicular Arrow Traffic Signal Supplement)—2004 Edition (ITE)
35. "Uniform Vehicle Code (UVC) and Model Traffic Ordinance," 2000 Edition (National Committee on Uniform Traffic Laws and Ordinances—NCUTLO)
36. "NEMA Standards Publication TS 4-2005 Hardware Standards for Dynamic Message Signs (DMS) With NTCIP Requirements," 2005 Edition (National Electrical Manufacturers Association—NEMA)
37. "Occupational Safety and Health Administration Regulations (Standards - 29 CFR), General Safety and Health Provisions - 1926.20," amended June 30, 1993 (Occupational Safety and Health Administration—OSHA)
38. "Accessible Pedestrian Signals—A Guide to Best Practices (NCHRP Web-Only Document 117A)," 2008 Edition (Transportation Research Board—TRB)
39. "Guidelines for Accessible Pedestrian Signals (NCHRP Web-Only Document 117B)," 2008 Edition (TRB)



- 40. "Highway Capacity Manual," 2000 Edition (TRB)
- 41. "Recommended Procedures for the Safety Performance Evaluation of Highway Features," (NCHRP Report 350), 1993 Edition (TRB)
- 42. "The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)," July 1998 Edition (The U.S. Access Board)
- 43. "Methods for Maintaining Pavement Marking Retroreflectivity," (FHWA-SA-22-028), 2022 Edition (FHWA)

Section 1A.12 Color Code

Support:

- 01 The following color code establishes general meanings for 11 colors of a total of 13 colors that have been identified as being appropriate for use in conveying traffic control information. tolerance limits for each color are contained in 23 CFR Part 655, Appendix to Subpart F and are available at the Federal Highway Administration's MUTCD website at <http://mutcd.fhwa.dot.gov> or by writing to the FHWA, Office of Safety Research and Development (HRD-T-301), 6300 Georgetown Pike, McLean, VA 22101.
- 02 The two colors for which general meanings have not yet been assigned are being reserved for future applications that will be determined only by FHWA after consultation with the States, the engineering community, and the general public. The meanings described in this Section are of a general nature. More specific assignments of colors are given in the individual Parts of this Manual relating to each class of devices.

Standard:

- 03 The general meaning of the 13 colors shall be as follows:
 - A. Black—regulation
 - B. Blue—road user services guidance, tourist information, and evacuation route
 - C. Brown—recreational and cultural interest area guidance
 - D. Coral—unassigned
 - E. Fluorescent Pink—incident management
 - F. Fluorescent Yellow-Green—pedestrian warning, bicycle warning, playground warning, school bus and school warning
 - G. Green—indicated movements permitted, direction guidance
 - H. Light Blue—unassigned
 - I. Orange—temporary traffic control
 - J. Purple—lanes restricted to use only by vehicles with registered electronic toll collection (ETC) accounts
 - K. Red—stop or prohibition
 - L. White—regulation
 - M. Yellow—warning

Section 1A.13 Definitions of Headings, Words, and Phrases in this Manual

Standard:

- 01 When used in this Manual, the text headings of Standard, Guidance, Option, and Support shall be defined as follows:
 - A. Standard—a statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device. All Standard statements are labeled, and the text appears in bold type. The verb "shall" is typically used. The verbs "should" and "may" are not used in Standard statements. Standard statements are sometimes modified by Options.
 - B. Guidance—a statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. All Guidance statements are labeled, and the text appears in unbold type. The verb "should" is typically used. The verbs "shall" and "may" are not used in Guidance statements. Guidance statements are sometimes modified by Options.
 - C. Option—a statement of practice that is a permissive condition and carries no requirement or recommendation. Option statements sometime contain allowable modifications to a Standard or Guidance statement. All Option statements are labeled, and the text appears in unbold type. The verb "may" is typically used. The verbs "shall" and "should" are not used in Option statements.
 - D. Support—an informational statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. Support statements are labeled, and the text appears in unbold type. The verbs "shall," "should," and "may" are not used in Support statements.



California Traffic Control Devices Committee Agenda Item Report



PART 3 MARKINGS

CHAPTER 3A. GENERAL

Section 3A.01 Functions and Limitations

Support:

- 01 Markings on highways and on private roads open to public travel have important functions in providing guidance and information for the road user. Major marking types include pavement and curb markings, delineators, colored pavements, channelizing devices, and islands. In some cases, markings are used to supplement other traffic control devices such as signs, signals, and other markings. In other instances, markings are used alone to effectively convey regulations, guidance, or warnings in ways not obtainable by the use of other devices.
- 02 Markings have limitations. Visibility of the markings can be limited by snow, debris, and water on or adjacent to the markings. Marking durability is affected by material characteristics, traffic volumes, weather, and location. However, under most highway conditions, markings provide important information while allowing minimal diversion of attention from the roadway.

Section 3A.02 Standardization of Application

Standard:

- 01 Each standard marking shall be used only to convey the meaning prescribed for that marking in this Manual. When used for applications not described in this Manual, markings shall conform in all respects to the principles and standards set forth in this Manual.

Guidance:

- 02 *Before any new highway, private road open to public travel (see definition in Section 1A.13), paved detour, or temporary route is opened to public travel, all necessary markings should be in place.*

Standard:

- 03 Markings that must be visible at night shall be retroreflective unless ambient illumination assures that the markings are adequately visible. All markings on Interstate highways shall be retroreflective.
- 04 Markings that are no longer applicable for roadway conditions or restrictions and that might cause confusion for the road user shall be removed or obliterated to be unidentifiable as a marking as soon as practical.

Option:

- 05 Until they can be removed or obliterated, markings may be temporarily masked with tape that is approximately the same color as the pavement.

Section 3A.03 Maintaining Minimum Pavement Marking Retroreflectivity

Standard:

- 01 Except as provided in Paragraph 5, a method designed to maintain retroreflectivity at or above 50 mcd/m²/lx under dry conditions shall be used for longitudinal markings on roadways with speed limits of 35 mph or greater.

Guidance:

- 02 *Except as provided in Paragraph 5, a method designed to maintain retroreflectivity at or above 100 mcd/m²/lx under dry conditions should be used for longitudinal markings on roadways with speed limits of 70 mph or greater.*
- 03 *The method used to maintain retroreflectivity should be one or more of those described in "Methods for Maintaining Pavement Marking Retroreflectivity" (see Section 1A.11) or developed from an engineering study based on the values in Paragraphs 1 and 2.*

Support:

- 04 Retroreflectivity levels for pavement markings are measured with an entrance angle of 88.76 degrees and an observation angle of 1.05 degrees. This geometry is also referred to as 30-meter geometry. The units of pavement marking retroreflectivity are reported in mcd/m²/lx, which means millicandelas per square meter per lux.

Option:

- 05 The following markings may be excluded from the provisions established in Paragraphs 1 and 2:
 - A. Markings where ambient illumination assures that the markings are adequately visible;
 - B. Markings on streets or highways that have an ADT of less than 6,000 vehicles per day;

- C. Dotted extension lines that extend a longitudinal line through an intersection, major driveway, or interchange area (see Section 3B.08);
- D. Curb markings;
- E. Parking space markings; and
- F. Shared-use path markings.

Support:

06 The provisions of this Section do not apply to non-longitudinal pavement markings including, but not limited to, the following:

- A. Transverse markings;
- B. Word, symbol, and arrow markings;
- C. Crosswalk markings; and
- D. Chevron, diagonal, and crosshatch markings.

Rev. 3

07 Special circumstances will periodically cause pavement marking retroreflectivity to be below the minimum levels. These circumstances include, but are not limited to, the following:

- A. Isolated locations of abnormal degradation;
- B. Periods preceding imminent resurfacing or reconstruction;
- C. Unanticipated events such as equipment breakdowns, material shortages, and contracting problems; and
- D. Loss of retroreflectivity resulting from snow maintenance operations.

When such circumstances occur, compliance with Paragraphs 1 and 2 is still considered to be achieved if a reasonable course of action is taken to resume maintenance of minimum retroreflectivity in a timely manner according to the maintaining agency's method(s), policies, and procedures.

Section 3A.04 Materials

Support:

- 01 Pavement and curb markings are commonly placed by using paints or thermoplastics; however, other suitable marking materials, including raised pavement markers and colored pavements, are also used. Delineators and channelizing devices are visibly placed in a vertical position similar to signs above the roadway.
- 02 Some marking systems consist of clumps or droplets of material with visible open spaces of bare pavement between the material droplets. These marking systems can function in a manner that is similar to the marking systems that completely cover the pavement surface and are suitable for use as pavement markings if they meet the other pavement marking requirements of the highway agency.

Guidance:

- 03 *The materials used for markings should provide the specified color throughout their useful life.*
- 04 *Consideration should be given to selecting pavement marking materials that will minimize tripping or loss of traction for road users, including pedestrians, bicyclists, and motorcyclists.*
- 05 *Delineators should not present a vertical or horizontal clearance obstacle for pedestrians.*

Section 3A.05 Colors

Standard:

- 01 Markings shall be yellow, white, red, blue, or purple. The colors for markings shall conform to the standard highway colors. Black in conjunction with one of the colors mentioned in the first sentence of this paragraph shall be a usable color.
- 02 When used, white markings for longitudinal lines shall delineate:
 - A. The separation of traffic flows in the same direction, or
 - B. The right-hand edge of the roadway.
- 03 When used, yellow markings for longitudinal lines shall delineate:
 - A. The separation of traffic traveling in opposite directions,
 - B. The left-hand edge of the roadways of divided highways and one-way streets or ramps, or
 - C. The separation of two-way left-turn lanes and reversible lanes from other lanes.
- 04 When used, red raised pavement markers or delineators shall delineate:
 - A. Truck escape ramps, or
 - B. One-way roadways, ramps, or travel lanes that shall not be entered or used in the direction from which the markers are visible.



California Traffic Control Devices Committee Agenda Item Report



2009 Edition - Revision 3

Page 349

- 05 When used, blue markings shall supplement white markings for parking spaces for persons with disabilities.
- 06 When used, purple markings shall supplement lane line or edge line markings for toll plaza approach lanes that are restricted to use only by vehicles with registered electronic toll collection accounts.
Option:
- 07 Colors used for official route shield signs (see Section 2D.11) may be used as colors of symbol markings to simulate route shields on the pavement (see Section 3B.20.)
- 08 Black may be used in combination with the colors mentioned in the first sentence of Paragraph 1 where a light-colored pavement does not provide sufficient contrast with the markings.
Support:
- 09 When used in combination with other colors, black is not considered a marking color, but only a contrast-enhancing system for the markings.

Section 3A.06 Functions, Widths, and Patterns of Longitudinal Pavement Markings

Standard:

- 01 The general functions of longitudinal lines shall be:
 - A. A double line indicates maximum or special restrictions,
 - B. A solid line discourages or prohibits crossing (depending on the specific application),
 - C. A broken line indicates a permissive condition, and
 - D. A dotted line provides guidance or warning of a downstream change in lane function.
- 02 The widths and patterns of longitudinal lines shall be as follows:
 - A. Normal line—4 to 6 inches wide.
 - B. Wide line—at least twice the width of a normal line.
 - C. Double line—two parallel lines separated by a discernible space.
 - D. Broken line—normal line segments separated by gaps.
 - E. Dotted line—noticeably shorter line segments separated by shorter gaps than used for a broken line. The width of a dotted line extension shall be at least the same as the width of the line it extends.

Support:

- 03 The width of the line indicates the degree of emphasis.
Guidance:
- 04 Broken lines should consist of 10-foot line segments and 30-foot gaps, or dimensions in a similar ratio of line segments to gaps as appropriate for traffic speeds and need for delineation.
Support:
- 05 Patterns for dotted lines depend on the application (see Sections 3B.04 and 3B.08.)
Guidance:
- 06 A dotted line for line extensions within an intersection or taper area should consist of 2-foot line segments and 2- to 6-foot gaps. A dotted line used as a lane line should consist of 3-foot line segments and 9-foot gaps.

July 2022

Sect. 3A.05 to 3A.06