

# California Manual on Uniform Traffic Control Devices

FHWA's MUTCD 2009 Edition as amended for use in California

## Temporary Traffic Control

### 2012 Edition

State of California  
Business, Transportation and Housing Agency  
Department of Transportation





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

The California Manual on Uniform Traffic Control Devices (California MUTCD) is published by the State of California, Department of Transportation and is issued to adopt uniform standards and specifications for all official traffic control devices, in accordance with Section 21400 of the California Vehicle Code.

This manual is current as of the date of publication on the footer page. However, it may be necessary from time to time to modify, change or adopt new standards and specifications for traffic control devices and/or issue errata or editorial changes to the manual. To ensure that the traffic control device practitioner is accessing the most current information regarding traffic control device topics for California, the practitioner is advised to always reference the California MUTCD web site.

The California MUTCD, California Sign Specifications and other publications and related current information is available on the Internet at the following web link:

<http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/>

#### Addresses for Publications Referenced in the California MUTCD

American Automobile Association (AAA)  
1000 AAA Drive  
Heathrow, FL 32746  
[www.aaa.com](http://www.aaa.com)  
800-222-4357

American Association of State Highway and Transportation Officials (AASHTO)  
444 North Capitol Street, NW, Suite 249  
Washington, DC 20001  
[www.transportation.org](http://www.transportation.org)  
202-624-5800

American National Standards Institute (ANSI)  
1819 L Street, NW, 6th floor  
Washington, DC 20036  
[www.ansi.org](http://www.ansi.org)  
202-293-8020

American Railway Engineering and Maintenance-of-Way Association (AREMA)  
10003 Derekwood Lane, Suite 210  
Lanham, MD 20706  
[www.arema.org](http://www.arema.org)  
301-459-3200

California Building Standards Code  
International Conference of Building Officials  
5360 South Workman Mill Road  
Whittier, CA 90601  
[www.icbo.org](http://www.icbo.org)  
916-263-0916

California Code Publications &  
California Law  
<http://www.leginfo.ca.gov/calaw.html>

California Department of Transportation Publications  
Publications Distribution Unit  
1900 Royal Oaks Drive  
Sacramento, CA 95815-3800  
<http://caltrans-opac.ca.gov/publicat.htm>  
916-263-0822

California Vehicle Code  
Department of Motor Vehicles  
Sacramento, California  
<http://www.dmv.ca.gov/pubs/pubs.htm>  
800-777-0133

Federal Highway Administration Report Center  
Facsimile number: 814-239-2156  
[report.center@fhwa.dot.gov](mailto:report.center@fhwa.dot.gov)

Illuminating Engineering Society (IES)  
120 Wall Street, Floor 17  
New York, NY 10005  
[www.iesna.org](http://www.iesna.org)  
212-248-5000

Institute of Makers of Explosives  
1120 19th Street, NW, Suite 310  
Washington, DC 20036-3605  
[www.ime.org](http://www.ime.org)  
202-429-9280

Institute of Transportation Engineers (ITE)  
1099 14th Street, NW, Suite 300 West  
Washington, DC 20005-3438  
[www.ite.org](http://www.ite.org)  
202-289-0222

International Organization for Standardization  
1, ch. de la Voie-Creuse  
Case Postale 56  
CH-1211  
Geneva 20, Switzerland  
[www.iso.ch](http://www.iso.ch)  
011-41-22-749-0111

International Safety Equipment Association (ISEA)  
1901 North Moore Street, Suite 808  
Arlington, VA 22209  
[www.safetyequipment.org](http://www.safetyequipment.org)  
703-525-1695

National Committee on Uniform Traffic Laws and Ordinances (NCUTLO)  
107 South West Street, Suite 110  
Alexandria, VA 22314  
[www.ncutlo.org](http://www.ncutlo.org)  
800-807-5290

National Electrical Manufacturers Association (NEMA)  
1300 North 17th Street, Suite 1752  
Rosslyn, VA 22209  
[www.nema.org](http://www.nema.org)  
703-841-3200

Occupational Safety and Health Administration (OSHA)  
U.S. Department of Labor  
200 Constitution Avenue, NW  
Washington, DC 20210  
[www.osha.gov](http://www.osha.gov)  
800-321-6742

Transportation Research Board (TRB)  
The National Academies  
500 Fifth Street, NW  
Washington, DC 20001  
[www.nas.edu/trb](http://www.nas.edu/trb)  
202-334-3072

U.S. Architectural and Transportation Barriers Compliance Board (The U.S. Access Board)  
1331 F Street, NW, Suite 1000  
Washington, DC 20004-1111  
[www.access-board.gov](http://www.access-board.gov)  
202-272-0080

## Acknowledgments

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

The Department of Transportation gratefully acknowledges the contribution from the following persons for providing invaluable time, support, guidance and direction in the development of this Manual:

- Federal Highway Administration's California Division
- California Traffic Control Devices Committee (CTCDC) members;
  - John Fisher, Chairman of CTCDC, City of Los Angeles;
  - Farhad Mansourian, Marin County;
  - Jacob Babico, San Bernardino County;
  - Hamid Bahadori, Automobile Club of Southern California;
  - Wayne Henley, Department of Transportation, State of California;
  - Jeff Knowles, City of Vacaville;
  - William Winter, County of Los Angeles;
  - John Keller, California Highway Patrol;
  - Michael Robinson, San Diego County;
  - Mark Greenwood, City of Palm Desert;
  - Deborah Wong, California State Automobile Association
- Staff from various cities and counties in California who participated in CTCDC meetings and workshops
- Department's headquarters and districts staff

Information regarding the California portion (blue text and/or blue border line) of this Manual can be obtained by writing to:

State of California  
Department of Transportation,  
Chief, Division of Traffic Operations, MS-36  
1120 N Street, Sacramento, CA 95814.

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The California MUTCD is available on the Department of Transportation Web Page at:  
<http://www.dot.ca.gov/camutcd>

**DEPARTMENT OF TRANSPORTATION**

## OFFICE OF TRAFFIC OPERATIONS

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January 13, 2012

Mr. John E. Fisher  
Chairman  
California Traffic Control Devices Committee  
P.O. Box 942874, MS-36  
Sacramento, CA 94274-0001

Dear Mr. Fisher:

The California Department of Transportation (Department) has adopted the California Manual on Uniform Traffic Control Devices (CA MUTCD) 2012 edition to provide for uniform standards and specifications for all official traffic control devices in California. This action was taken pursuant to the provisions of California Vehicle Code Section 21400 and the recommendation of the California Traffic Control Devices Committee (CTCDC). The Department requested and has received a letter to confirm substantial conformance from the Federal Highway Administration (FHWA) for CA MUTCD 2012 edition. The revised document is available on the Internet at:

[www.dot.ca.gov/camutcd](http://www.dot.ca.gov/camutcd)

The revised CA MUTCD includes FHWA's 2009 MUTCD. The revision also includes all policies on traffic control devices issued by the Department since January 21, 2010, and other corrections and format changes that were necessary to update the previous documents. A draft version of the revised CA MUTCD was made available to the Department's district staff, local agencies and the general public for review and comment during the open public comment period, which began on August 9, 2010 and closed on October 10, 2011. The Department held five workshops with staff representing local agencies from April 14, 2010 to July 22, 2011 to discuss the revision and changes being incorporated. The CTCDC also reviewed the revised CA MUTCD at their October 20, 2011 meeting in Rancho Cordova and made a recommendation to the Department to adopt the new manual.

The Division of Traffic Operations is grateful to the CTCDC members and acknowledges their staff for providing invaluable time, support, guidance and direction in the development of this document.

Mr. John Fisher  
January 13, 2012  
Page 2

If you have any questions, please contact Johnny Bhullar at (916) 654-7312 or by email at [<Johnny.bhullar@dot.ca.gov.>](mailto:Johnny.bhullar@dot.ca.gov)

Sincerely,

A handwritten signature in blue ink, appearing to read 'ROBERT COPP', with a long horizontal stroke extending to the right.

ROBERT COPP  
Chief  
Division of Traffic Operations

c:  
Devinder Singh, Executive Secretary, CTCDC



U.S. Department  
of Transportation  
**Federal Highway  
Administration**

**Federal Highway Administration  
California Division**

650 Capitol Mall, Suite 4-100  
Sacramento CA 95814

January 12, 2012

IN REPLY REFER TO  
HDA-CA

Mr. Malcolm Dougherty  
California Department of Transportation  
1120 N Street  
Sacramento, CA 95814

Dear Mr. Dougherty:

I am writing in response to the December 27, 2011, letter from Robert Copp requesting a determination that the California Manual on Uniform Traffic Control Devices for Streets and Highways (CA MUTCD) be found to be in substantial conformance with the national Manual on Uniform Traffic Control Devices for Streets and Highways, 2009 Edition (2009 MUTCD).

In December 2009, The Federal Highway Administration published the 2009 MUTCD, which became effective on January 15, 2010. As required by 23 CFR 655.603, the State of California must revise the CA MUTCD to be in substantial conformance with the 2009 MUTCD. Our office has reviewed the proposed revisions to the CA MUTCD, to be published on January 13, 2012, and we find it to be in substantial conformance with the 2009 MUTCD.

We commend the effort of Caltrans to address a number of issues that have lead to this determination of substantial conformance. We look forward to continuing to work with Caltrans, local agencies, and the California Traffic Control Devices Committee in the future to continuously improve the quality of the CA MUTCD and implement traffic control devices that will enhance the safety of the state's roadways.

Should you have questions, please do not hesitate to contact Steve Pyburn, Senior Transportation Engineer, at (916) 498-5057 or [steve.pyburn@dot.gov](mailto:steve.pyburn@dot.gov).

Sincerely,

For  
Vincent P. Mammano  
Division Administrator



**DEPARTMENT OF TRANSPORTATION****OFFICE OF TRAFFIC OPERATIONS**

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*Flex your power!  
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December 27, 2011

Mr. Vincent Mammano  
Division Administrator  
Federal Highway Administration  
650 Capitol Mall, Suite 4-100  
Sacramento, CA 95814

Dear Mr. Mammano:

The California Department of Transportation (Department) is requesting a letter to confirm substantial conformance of the revised California Manual on Uniform Traffic Control Devices (CA MUTCD) 2012 edition (2009 National MUTCD, as amended for use in California) from the Federal Highway Administration (FHWA). This letter is required per title 23, Code of Federal Regulations (23 CFR 655.603(b)(1)). The revised California MUTCD includes FHWA's 2009 MUTCD. The revision also includes all policies on traffic control devices issued by the Department since January 21, 2010, and other corrections and format changes that were necessary to update the previous documents. The revised document is available on the Internet at:

[www.dot.ca.gov/camutcd](http://www.dot.ca.gov/camutcd)

A draft version of the revised CA MUTCD was made available to the Department's district staff, local agencies and the general public for review and comment during the open public comment period, which began on August 9, 2010 and closed on October 10, 2011. The Department held five workshops with staff representing local agencies from April 14, 2010 to July 22, 2011 to discuss the revision and changes being incorporated. The California Traffic Control Devices Committee (CTCDC) also reviewed the revised CA MUTCD at their October 20, 2011 meeting in Rancho Cordova and made a recommendation to the Department to adopt the new manual.

We would like to acknowledge the efforts of Steve Pyburn of your office for working closely with Johnny Bhullar of the Department's Division of Traffic Operations in reviewing the draft revision of the CA MUTCD. This review process was completed to ensure the changes made would be in conformance with the FHWA's 2009 MUTCD.

Mr. Vincent Mammano  
December 27, 2011  
Page 2

If you have any questions, please contact Johnny Bhullar at (916) 654-7312 or by email at  
<[Johnny.bhuyllar@dot.ca.gov](mailto:Johnny.bhuyllar@dot.ca.gov).>

Sincerely,

A handwritten signature in black ink, appearing to be 'R. Copp', written over a horizontal line.

ROBERT COPP  
Chief  
Division of Traffic Operations

c:  
Devinder Singh, Executive Secretary, CTCDC

## CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

### TABLE OF CONTENTS

	<u>Page</u>
<b>INTRODUCTION</b>	<b>53</b>
<b>PART 1. GENERAL</b>	<b>63</b>
<b>CHAPTER 1A. GENERAL</b>	<b>63</b>
Section 1A.01 Purpose of Traffic Control Devices	63
Section 1A.02 Principles of Traffic Control Devices	63
Section 1A.03 Design of Traffic Control Devices	64
Section 1A.04 Placement and Operation of Traffic Control Devices	64
Section 1A.05 Maintenance of Traffic Control Devices	64
Section 1A.06 Uniformity of Traffic Control Devices	64
Section 1A.07 Responsibility for Traffic Control Devices	65
Section 1A.08 Authority for Placement of Traffic Control Devices	66
Section 1A.09 Engineering Study and Engineering Judgment	68
Section 1A.10 Interpretations, Experimentations, Changes, and Interim Approvals	68
Section 1A.11 Relation to Other Publications	73
Section 1A.12 Color Code	75
Section 1A.13 Definitions of Headings, Words, and Phrases in this Manual	76
Section 1A.14 Meanings of Acronyms and Abbreviations in this Manual	93
Section 1A.15 Abbreviations Used on Traffic Control Devices	99
<b>PART 6 TEMPORARY TRAFFIC CONTROL</b>	<b>1019</b>
<b>CHAPTER 6A GENERAL</b>	<b>1019</b>
Section 6A.01 General	1019
<b>CHAPTER 6B FUNDAMENTAL PRINCIPLES</b>	<b>1021</b>
Section 6B.01 Fundamental Principles of Temporary Traffic Control	1021
<b>CHAPTER 6C TEMPORARY TRAFFIC CONTROL ELEMENTS</b>	<b>1025</b>
Section 6C.01 Temporary Traffic Control Plans	1025
Section 6C.02 Temporary Traffic Control Zones	1027
Section 6C.03 Components of Temporary Traffic Control Zones	1027
Section 6C.04 Advance Warning Area	1028
Section 6C.05 Transition Area	1028
Section 6C.06 Activity Area	1028
Section 6C.07 Termination Area	1029
Section 6C.08 Tapers	1030
Section 6C.09 Detours and Diversions	1031
Section 6C.10 One-Lane, Two-Way Traffic Control	1031

Section 6C.11	Flagger Method of One-Lane, Two-Way Traffic Control	1031
Section 6C.12	Flag Transfer Method of One-Lane, Two-Way Traffic Control	1032
Section 6C.13	Pilot Car Method of One-Lane, Two-Way Traffic Control	1032
Section 6C.14	Temporary Traffic Control Signal Method of One-Lane, Two-Way Traffic Control	1032
Section 6C.15	Stop or Yield Control Method of One-Lane, Two-Way Traffic Control	1032
<b>CHAPTER 6D</b>	<b>PEDESTRIAN AND WORKER SAFETY</b>	<b>1039</b>
Section 6D.01	Pedestrian Considerations	1039
Section 6D.02	Accessibility Considerations	1041
Section 6D.03	Worker Safety Considerations	1042
Section 6D.101(CA)	Bicycle Considerations	1044
<b>CHAPTER 6E</b>	<b>FLAGGER CONTROL</b>	<b>1045</b>
Section 6E.01	Qualifications for Flaggers	1045
Section 6E.02	High-Visibility Safety Apparel	1045
Section 6E.03	Hand-Signaling Devices	1046
Section 6E.04	Automated Flagger Assistance Devices	1047
Section 6E.05	STOP/SLOW Automated Flagger Assistance Devices	1048
Section 6E.06	Red/Yellow Lens Automated Flagger Assistance Devices	1050
Section 6E.07	Flagger Procedures	1051
Section 6E.08	Flagger Stations	1052
<b>CHAPTER 6F</b>	<b>TEMPORARY TRAFFIC CONTROL ZONE DEVICES</b>	<b>1057</b>
Section 6F.01	Types of Devices	1057
Section 6F.02	General Characteristics of Signs	1058
Section 6F.03	Sign Placement	1059
Section 6F.04	Sign Maintenance	1060
Section 6F.05	Regulatory Sign Authority	1060
Section 6F.06	Regulatory Sign Design	1060
Section 6F.07	Regulatory Sign Applications	1060
Section 6F.08	ROAD (STREET) CLOSED Sign (R11-2)	1061
Section 6F.09	Local Traffic Only Signs (R11-3a, R11-4)	1061
Section 6F.10	Weight Limit Signs (R12-1, R12-2, R12-5)	1061
Section 6F.11	STAY IN LANE Sign (R4-9)	1061
Section 6F.12	Work Zone and Higher Fines Signs and Plaques	1061
Section 6F.13	PEDESTRIAN CROSSWALK Sign (R9-8)	1063
Section 6F.14	SIDEWALK CLOSED Signs (R9-9, R9-10, R9-11, R9-11a)	1063
Section 6F.15	Special Regulatory Signs	1063
Section 6F.16	Warning Sign Function, Design, and Application	1063
Section 6F.17	Position of Advance Warning Signs	1064
Section 6F.18	ROAD (STREET) WORK Sign (W20-1)	1064
Section 6F.19	DETOUR Sign (W20-2)	1065
Section 6F.20	ROAD (STREET) CLOSED Sign (W20-3)	1065
Section 6F.21	ONE LANE ROAD Sign (W20-4)	1065
Section 6F.22	Lane(s) Closed Signs (W20-5, W20-5a)	1066
Section 6F.23	CENTER LANE CLOSED AHEAD Sign (W9-3)	1066
Section 6F.24	Lane Ends Sign (W4-2)	1066
Section 6F.25	ON RAMP Plaque (W13-4P)	1066
Section 6F.26	RAMP NARROWS Sign (W5-4)	1066

Section 6F.27	SLOW TRAFFIC AHEAD Sign (W23-1)	1067
Section 6F.28	EXIT OPEN and EXIT CLOSED Signs (E5-2, E5-2a)	1067
Section 6F.29	EXIT ONLY Sign (E5-3)	1068
Section 6F.30	NEW TRAFFIC PATTERN AHEAD Sign (W23-2)	1068
Section 6F.31	Flagger Signs (W20-7, W20-7a)	1068
Section 6F.32	Two-Way Traffic Sign (W6-3)	1068
Section 6F.33	Workers Signs (W21-1, W21-1a)	1068
Section 6F.34	FRESH OIL (TAR) Sign (W21-2)	1069
Section 6F.35	ROAD MACHINERY AHEAD Sign (W21-3)	1069
Section 6F.36	Motorized Traffic Signs (W8-6, W11-10)	1069
Section 6F.37	Shoulder Work Signs (W21-5, W21-5a, W21-5b)	1069
Section 6F.38	SURVEY CREW Sign (W21-6)	1069
Section 6F.39	UTILITY WORK Sign (W21-7)	1070
Section 6F.40	Signs for Blasting Areas	1070
Section 6F.41	BLASTING ZONE AHEAD Sign (W22-1)	1070
Section 6F.42	TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2)	1070
Section 6F.43	END BLASTING ZONE Sign (W22-3)	1070
Section 6F.44	Shoulder Signs and Plaque (W8-4, W8-9, W8-17, and W8-17P)	1070
Section 6F.45	UNEVEN LANES Sign (W8-11)	1071
Section 6F.46	STEEL PLATE AHEAD Sign (W8-24)	1071
Section 6F.47	NO CENTER LINE Sign (W8-12)	1071
Section 6F.48	Reverse Curve Signs (W1-4 Series)	1071
Section 6F.49	Double Reverse Curve Signs (W24-1 Series)	1071
Section 6F.50	Other Warning Signs	1072
Section 6F.51	Special Warning Signs	1072
Section 6F.52	Advisory Speed Plaque (W13-1P)	1072
Section 6F.53	Supplementary Distance Plaque (W7-3aP)	1072
Section 6F.54	Motorcycle Plaque (W8-15P)	1073
Section 6F.55	Guide Signs	1073
Section 6F.56	ROAD WORK NEXT XX MILES Sign (G20-1)	1073
Section 6F.57	END ROAD WORK Sign (G20-2)	1073
Section 6F.58	PILOT CAR FOLLOW ME Sign (G20-4)	1074
Section 6F.59	Detour Signs (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-9c, and M4-10)	1074
Section 6F.60	Portable Changeable Message Signs	1075
Section 6F.61	Arrow Boards	1077
Section 6F.62	High-Level Warning Devices (Flag Trees)	1079
Section 6F.63	Channelizing Devices	1080
Section 6F.64	Cones	1081
Section 6F.65	Tubular Markers	1082
Section 6F.66	Vertical Panels	1083
Section 6F.67	Drums	1083
Section 6F.68	Type 1, 2, or 3 Barricades	1084
Section 6F.69	Direction Indicator Barricades	1085
Section 6F.70	Temporary Traffic Barriers as Channelizing Devices	1086
Section 6F.71	Longitudinal Channelizing Devices	1086
Section 6F.72	Temporary Lane Separators	1087
Section 6F.73	Other Channelizing Devices	1087
Section 6F.74	Detectable Edging for Pedestrians	1087
Section 6F.75	Temporary Raised Islands	1088
Section 6F.76	Opposing Traffic Lane Divider and Sign (W6-4)	1088
Section 6F.77	Pavement Markings	1089
Section 6F.78	Temporary Markings	1089
Section 6F.79	Temporary Raised Pavement Markers	1090

Section 6F.80	Delineators	1091
Section 6F.81	Lighting Devices	1091
Section 6F.82	Floodlights	1092
Section 6F.83	Warning Lights	1092
Section 6F.84	Temporary Traffic Control Signals	1093
Section 6F.85	Temporary Traffic Barriers	1094
Section 6F.86	Crash Cushions	1095
Section 6F.87	Rumble Strips	1096
Section 6F.88	Screens	1097
Section 6F.101(CA)	LOOSE GRAVEL Sign (W8-7)	1097
Section 6F.102(CA)	NARROW LANE(S) Sign (C12(CA))	1098
Section 6F.103(CA)	OPEN TRENCH Sign (C27(CA))	1098
Section 6F.104(CA)	Moving Lane Closure Signs (W23-1 and SC10(CA), SC11(CA), SC13(CA), SC15(CA))	1098
Section 6F.105(CA)	Object Markers	1099
Section 6F.106(CA)	Slow For The Cone Zone (SC19(CA) and SC20(CA)) Signs	1099
Section 6F.107(CA)	FRESH CONCRETE (C43(CA)) Sign	1099
Section 6F.108(CA)	CAUTION FREQUENT STOPPING AND BACKING STAY BACK 100 FEET (SC21(CA)) Sign	1099

**CHAPTER 6G TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES 1119**

Section 6G.01	Typical Applications	1119
Section 6G.02	Work Duration	1119
Section 6G.03	Location of Work	1121
Section 6G.04	Modifications To Fulfill Special Needs	1121
Section 6G.05	Work Affecting Pedestrian and Bicycle Facilities	1122
Section 6G.06	Work Outside of the Shoulder	1123
Section 6G.07	Work on the Shoulder with No Encroachment	1123
Section 6G.08	Work on the Shoulder with Minor Encroachment	1124
Section 6G.09	Work Within the Median	1124
Section 6G.10	Work Within the Traveled Way of a Two-Lane Highway	1124
Section 6G.11	Work Within the Traveled Way of an Urban Street	1125
Section 6G.12	Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway	1126
Section 6G.13	Work Within the Traveled Way at an Intersection	1127
Section 6G.14	Work Within the Traveled Way of a Freeway or Expressway	1128
Section 6G.15	Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway	1129
Section 6G.16	Crossovers	1129
Section 6G.17	Interchanges	1129
Section 6G.18	Work in the Vicinity of a Grade Crossing	1130
Section 6G.19	Temporary Traffic Control During Nighttime Hours	1130

**CHAPTER 6H TYPICAL APPLICATIONS 1133**

Section 6H.01	Typical Applications	1133
---------------	----------------------	------

**CHAPTER 6I CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS 1251**

Section 6I.01	General	1251
Section 6I.02	Major Traffic Incidents	1252
Section 6I.03	Intermediate Traffic Incidents	1253
Section 6I.04	Minor Traffic Incidents	1253
Section 6I.05	Use of Emergency-Vehicle Lighting	1254

**APPENDIX A1. CONGRESSIONAL LEGISLATION 1399**

**APPENDIX A2. METRIC CONVERSIONS 1401**

**FIGURES Page**

Figure I-101(CA)	Deleted California Signs with Target Compliance Dates	62
Figure 1A-1	Process for Requesting and Conducting Experimentations for New Traffic Control Devices	100
Figure 1A-1(CA)	Process for Requesting and Conducting Experimentations for New Traffic Control Devices in California	101
Figure 1A-2	Process for Incorporating New Traffic Control Devices into the MUTCD	102
Figure 1A-101(CA)	Process for the Use of Traffic Control Devices in California Approved as Interim Approval (IA) by FHWA	103
Figure 6C-1	Component Parts of a Temporary Traffic Control Zone	1033
Figure 6C-2	Types of Tapers and Buffer Spaces	1034
Figure 6C-3	Example of a One-Lane, Two-Way Traffic Taper	1035
Figure 6E-1	Example of the Use of a STOP/SLOW Automated Flagger Assistance Device (AFAD)	1053
Figure 6E-2	Example of the Use of a Red/Yellow Lens Automated Flagger Assistance Device (AFAD)	1054
Figure 6E-3	Use of Hand-Signaling Devices by Flaggers	1055
Figure 6F-1	Height and Lateral Location of Signs—Typical Installations	1100
Figure 6F-2	Methods of Mounting Signs Other Than on Posts	1101
Figure 6F-3	Regulatory Signs and Plaques in Temporary Traffic Control Zones	1102
Figure 6F-4	Warning Signs and Plaques in Temporary Traffic Control Zones	1104
Figure 6F-5	Exit Open and Closed and Detour Signs	1107
Figure 6F-6	Advance Warning Arrow Board Display Specifications	1108
Figure 6F-7	Channelizing Devices	1109
Figure 6F-101(CA)	California Temporary Traffic Control Signs	1110
Figure 6F-102(CA)	Channelizer (CA) and Portable Delineator	1111
Figure 6F-103(CA)	Examples of Object Markers in Temporary Traffic Control Zones	1112
Figure 6H-1	Work Beyond the Shoulder (TA-1)	1138
Figure 6H-2	Blasting Zone (TA-2)	1140
Figure 6H-3	Work on the Shoulders (TA-3)	1142
<del>Figure 6H-4</del>	<del>Short Duration or Mobile Operation on a Shoulder (TA-4)</del>	<del>1144</del>
Figure 6H-4(CA)	Short-Duration or Mobile Operation on a Shoulder (TA-4)	1145
<del>Figure 6H-5</del>	<del>Shoulder Closure on a Freeway (TA-5)</del>	<del>1147</del>
Figure 6H-5(CA)	Shoulder Closure on a Freeway (TA-5)	1148
Figure 6H-6	Shoulder Work with Minor Encroachment (TA-6)	1150
Figure 6H-7	Road Closure with a Diversion (TA-7)	1152
Figure 6H-8	Road Closure with an Off-Site Detour (TA-8)	1154
Figure 6H-9	Overlapping Routes with a Detour (TA-9)	1156
<del>Figure 6H-10</del>	<del>Lane Closure on a Two-Lane Road Using Flaggers (TA-10)</del>	<del>1158</del>
Figure 6H-10(CA)	Lane Closure on a Two-Lane Road Using Flaggers (TA-10)	1159
Figure 6H-11	Lane Closure on a Two-Lane Road with Low Traffic Volumes (TA-11)	1161
Figure 6H-12	Lane Closure on a Two-Lane Road Using Traffic Control Signals (TA-12)	1163
Figure 6H-13	Temporary Road Closure (TA-13)	1165
<del>Figure 6H-14</del>	<del>Haul Road Crossing (TA-14)</del>	<del>1167</del>
Figure 6H-14(CA)	Haul Road Crossing (TA-14)	1168
Figure 6H-15	Work in the Center of a Road with Low Traffic Volumes (TA-15)	1170

Figure 6H-16	Surveying Along the Center Line of a Road with Low Traffic Volumes (TA-16)	1172
Figure 6H-17	Mobile Operations on a Two-Lane Road (TA-17)	1174
Figure 6H-18	Lane Closure on a Minor Street (TA-18)	1176
Figure 6H-19	Detour for One Travel Direction (TA-19)	1178
Figure 6H-20	Detour for a Closed Street (TA-20)	1180
Figure 6H-21	Lane Closure on the Near Side of an Intersection (TA-21)	1182
Figure 6H-22	Right-Hand Lane Closure on the Far Side of an Intersection (TA-22)	1184
Figure 6H-22A(CA)	Right-Hand Lane Closure on the Far Side of an Intersection (TA-22A(CA))	1185
Figure 6H-22B(CA)	Right-Hand Lane Closure on the Far Side of an Intersection (TA-22B(CA))	1186
Figure 6H-23	Left-Hand Lane Closure on the Far Side of an Intersection (TA-23)	1188
Figure 6H-24	Half Road Closure on the Far Side of an Intersection (TA-24)	1190
Figure 6H-24A(CA)	Half Road Closure on the Far Side of an Intersection (TA-24A(CA))	1191
Figure 6H-25	Multiple Lane Closures at an Intersection (TA-25)	1193
Figure 6H-25A(CA)	Multiple Lane Closures at an Intersection (TA-25A(CA))	1194
Figure 6H-26	Closure in the Center of an Intersection (TA-26)	1196
Figure 6H-27	Closure at the Side of an Intersection (TA-27)	1198
Figure 6H-28	Sidewalk Detour or Diversion (TA-28)	1200
Figure 6H-29	Crosswalk Closures and Pedestrian Detours (TA-29)	1202
Figure 6H-30	Interior Lane Closure on a Multi-Lane Street (TA-30)	1204
Figure 6H-31	Lane Closures on a Street with Uneven Directional Volumes (TA-31)	1206
<del>Figure 6H-32</del>	<del>Half Road Closure on a Multi-Lane, High-Speed Highway (TA-32)</del>	1208
Figure 6H-32(CA)	Half Road Closure on a Multi-Lane, High-Speed Highway (TA-32)	1209
Figure 6H-33	Stationary Lane Closure on a Divided Highway (TA-33)	1211
Figure 6H-34	Lane Closure with a Temporary Traffic Barrier (TA-34)	1213
Figure 6H-35	Mobile Operation on a Multi-Lane Road (TA-35)	1215
<del>Figure 6H-36</del>	<del>Lane Shift on a Freeway (TA-36)</del>	1218
Figure 6H-36(CA)	Lane Shift on a Freeway (TA-36)	1219
Figure 6H-37	Double Lane Closure on a Freeway (TA-37)	1221
<del>Figure 6H-38</del>	<del>Interior Lane Closure on a Freeway (TA-38)</del>	1223
Figure 6H-39	Median Crossover on a Freeway (TA-39)	1225
Figure 6H-40	Median Crossover for an Entrance Ramp (TA-40)	1227
Figure 6H-41	Median Crossover for an Exit Ramp (TA-41)	1229
Figure 6H-42	Work in the Vicinity of an Exit Ramp (TA-42)	1231
Figure 6H-43	Partial Exit Ramp Closure (TA-43)	1233
Figure 6H-44	Work in the Vicinity of an Entrance Ramp (TA-44)	1235
Figure 6H-45	Temporary Reversible Lane Using Movable Barriers (TA-45)	1237
Figure 6H-46	Work in the Vicinity of a Grade Crossing (TA-46)	1239
Figure 6H-101(CA)	Shoulder Closure on Urban (Low Speed) Locations to Accommodate Bicyclists	1241
Figure 6H-102(CA)	Lane Closure on Freeway, Expressway, Rural and Urban (High Speed) Locations to Accommodate Bicyclists	1243
Figure 6H-103(CA)	Detour for Bike Lane on Roads with Closure of One Travel Direction	1245
Figure 6H-104(CA)	Right Lane and Bike Lane Closure on Far Side of Intersection	1247
Figure 6H-105(CA)	Lane Shift on Road with Low Traffic Volumes	1249
Figure 6I-1	Examples of Traffic Incident Management Area Signs	1254

## TABLES

Table I-1	Evolution of the MUTCD	58
Table I-1(CA)	Evolution of the California MUTCD	58
Table I-2	Target Compliance Dates Established by the FHWA	59
Table I-101(CA)	Deleted California Signs with Target Compliance Dates	62
Table 1A-1	Acceptable Abbreviations	104
Table 1A-2	Abbreviations that Shall be Used Only on Portable Changeable Message Signs	105

Table 1A-3	Unacceptable Abbreviations	106
Table 6C-1	Recommended Advance Warning Sign Minimum Spacing	1036
Table 6C-2	Stopping Sight Distance as a Function of Speed	1036
Table 6C-3	Taper Length Criteria for Temporary Traffic Control Zones	1036
Table 6C-3(CA)	Taper Length Criteria for Temporary Traffic Control Zones (for 12 feet Offset Width)	1037
Table 6C-4	Formulas for Determining Taper Length	1037
Table 6E-1	Stopping Sight Distance as a Function of Speed	1056
Table 6E-101(CA)	Longitudinal Buffer Space or Flagger Station Spacing on Downgrades	1056
Table 6F-1	Temporary Traffic Control Zone Sign and Plaque Sizes	1113
Table 6F-1(CA)	California Temporary Traffic Control Zone Sign and Plaque Sizes	1116
Table 6F-101(CA)	Maximum Spacing of Channelizing Devices	1117
Table 6H-1	Index to Typical Applications	1134
Table 6H-1(CA)	Index to Typical Applications	1135
Table 6H-2	Meaning of Symbols on Typical Application Diagrams	1135
Table 6H-3	Meaning of Letter Codes on Typical Application Diagrams	1135
Table 6H-4	Formulas for Determining Taper Length	1136
Table 6H-4(CA)	Taper Length Criteria for Temporary Traffic Control Zones (for 12 feet Offset Width)	1136
Table A2-1	Conversion of Inches to Millimeters	1401
Table A2-2	Conversion of Feet to Meters	1401
Table A2-3	Conversion of Miles to Kilometers	1401
Table A2-4	Conversion of Miles per Hour to Kilometers/Hour	1401



## CALIFORNIA MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

### INTRODUCTION

#### Support:

<sup>00a</sup> This California Manual on Uniform Traffic Control Devices (California MUTCD) is published by the State of California, Department of Transportation and is issued to adopt uniform standards and specifications for all official traffic control devices in California, in accordance with Section 21400 of the California Vehicle Code (CVC).

<sup>00b</sup> This California MUTCD incorporates Federal Highway Administration's Manual on Uniform Traffic Control Devices (2009 Edition) dated December 16, 2009 and the previous California MUTCD dated January 21, 2010. It also incorporates all policies on traffic control devices issued by the California Department of Transportation that have been issued since January 21, 2010 and other editorial, errata and format changes that were necessary to update the previous documents.

#### Standard:

<sup>00c</sup> **The California MUTCD is hereby adopted as, and shall be the standard for all official traffic control devices, under Section 11340.9(h) of California Government Code and Section 21400 of California Vehicle Code.**

#### Support:

<sup>00d</sup> The California MUTCD supersedes and replaces the previously adopted (on January 21, 2010) California MUTCD as well as Chapters 4, 5, 6, 8, 10, 11, 12, and the traffic signals portion of chapter 9 of the 1996 Caltrans Traffic Manual, as amended, and all previous editions thereof. It does not supersede the Department's Standard Plans, Standard Specifications or the Standard Special Provisions publications.

<sup>00e</sup> Department of Transportation publishes Standard Specifications, Standard Special Provisions, Standard Plans and other manuals, which contain specifications and requirements for traffic control devices, including their use and placement, when performing work on State highways. In some cases those specifications and requirements can vary from, and be more stringent than those shown in the California MUTCD.

#### Standard:

<sup>00f</sup> **On State highways, the California MUTCD shall mean to include the Department of Transportation's Standard Plans, Standard Specifications and Standard Special Provisions publications.**

<sup>00g</sup> **On State highways, the California MUTCD shall not supersede the Department's Standard Plans, Standard Specifications or the Special Provisions publications but all Standard statements of the California MUTCD shall be met. On State highways, whenever there is a discrepancy between the specifications and requirements contained in the California MUTCD, and those contained in the Department's Standard Plans, Standard Specifications or the Special Provisions publications, the Department's Standard Plans, Standard Specifications or the Special Provisions publications shall govern.**

<sup>00h</sup> **Nothing contained in the California MUTCD shall prevent the Department of Transportation from modifying, changing or adopting new specifications as necessary. Any revisions to the Department's Standard Plans, Standard Specifications or the Special Provisions shall conform to the Standard statements of the California MUTCD.**

<sup>00i</sup> **Whenever there is a discrepancy between the specifications and requirements incorporated from FHWA's MUTCD and the California MUTCD amendments, the California MUTCD amendments shall govern.**

<sup>01</sup> **Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, or bikeway, ~~or private road open to public travel (see definition in Section 1A.13)~~ by authority of a public agency or official having jurisdiction, or, in the case of a private road, by authority of the private owner or private official having jurisdiction.**

<sup>02</sup> **The Manual on Uniform Traffic Control Devices (MUTCD) is incorporated by reference in 23 Code of Federal Regulations (CFR), Part 655, Subpart F and shall be recognized as the national standard for all traffic control devices installed on any street, highway, or bikeway, ~~or private road open to public travel (see definition in Section 1A.13)~~ in accordance with 23 U.S.C. 109(d) and 402(a). The MUTCD national standard and Department of Transportation standards and specifications for traffic control devices shall not be applicable to privately owned and maintained roads or commercial establishments, unless the particular city or county enacts an ordinance or resolution to this effect. Refer to CVC Sections 21100, 21100.1, 21107, 21107.5,**

**21107.6, and 21107.7. The policies and procedures of the Federal Highway Administration (FHWA) to obtain basic uniformity of traffic control devices shall be as described in 23 CFR 655, Subpart F.**

**<sup>03</sup> In accordance with 23 CFR 655.603(a), for the purposes of applicability of the MUTCD:**

- A. Toll roads under the jurisdiction of public agencies or authorities or public-private partnerships shall be considered to be public highways;**
- B. ~~Private roads open to public travel shall be as defined in Section 1A.13;~~ Privately owned and maintained roads or commercial establishments, if the particular city or county enacts an ordinance or resolution to this effect. Refer to CVC Sections 21100, 21100.1, 21107, 21107.5, 21107.6, and 21107.7.**and
- C. ~~Parking areas, including the driving aisles within those parking areas, that are either publicly or privately owned shall not be considered to be “open to public travel” for purposes of MUTCD applicability.~~ All publicly owned parking areas and only those privately owned parking areas where the particular city or county has enacted a resolution to this effect, including the driving aisles within those parking areas shall be subject to MUTCD applicability.**

**<sup>04</sup> Any traffic control device design or application provision contained in this Manual shall be considered to be in the public domain. Traffic control devices contained in this Manual shall not be protected by a patent, trademark, or copyright, except for the Interstate Shield and any items owned by FHWA. The California Department of Transportation logos consisting of the “CT” symbol and the “Caltrans” logotype are registered service marks and when used on any traffic control device they shall be presented in a uniform and consistent manner as outlined in the Department’s Deputy Directive DD-33-R1.**

Support:

<sup>05</sup> Pictographs, as defined in Section 1A.13, are embedded in traffic control devices but the pictographs themselves are not considered traffic control devices for the purposes of Paragraph 4.

<sup>05a</sup> This Manual is not applicable to privately owned and maintained roads or commercial establishments in California, unless the particular city or county enacts an ordinance or resolution to this effect. Refer to CVC Sections 21100, 21100.1, 21107, 21107.5, 21107.6, and 21107.7. However, the use of this Manual is encouraged on all privately owned and maintained roads or commercial establishments, in general, as a good practice. See Section 1A.07 for more information.

<sup>06</sup> The need for uniform standards was recognized long ago. The American Association of State Highway Officials (AASHO), now known as the American Association of State Highway and Transportation Officials (AASHTO), published a manual for rural highways in 1927, and the National Conference on Street and Highway Safety (NCSHS) published a manual for urban streets in 1930. In the early years, the necessity for unification of the standards applicable to the different classes of road and street systems was obvious. To meet this need, a joint committee of AASHO and NCSHS developed and published the original edition of this Manual on Uniform Traffic Control Devices (MUTCD) in 1935. That committee, now called the National Committee on Uniform Traffic Control Devices (NCUTCD), though changed from time to time in name, organization, and personnel, has been in continuous existence and has contributed to periodic revisions of this Manual. The FHWA has administered the MUTCD since the 1971 edition. The FHWA and its predecessor organizations have participated in the development and publishing of the previous editions. There were nine previous editions of the MUTCD, and several of those editions were revised one or more times. Table I-1 traces the evolution of the MUTCD, including the two manuals developed by AASHO and NCSHS.

<sup>06a</sup> The Division of Highways in California Department of Public Works, now known as Department of Transportation (Caltrans), published a Planning Manual of Instructions in 1952. Part 8, called Traffic was subsequently added to the Planning Manual in 1955. In 1972, the first separate publication called the Traffic Manual was published. Efforts were undertaken in 2000 by California Department of Transportation (Caltrans) along with California Traffic Control Devices Committee (CTCDC) to reconcile the Traffic Manual with the National Manual on Uniform Traffic Control Devices (MUTCD). These efforts culminated in the adoption of the National MUTCD with a California Supplement in 2004. In 2006, the California Supplement and the National MUTCD were combined into a single document, called the California MUTCD. Table I-1(CA) traces the evolution of the California MUTCD.

**Standard:**

**<sup>07</sup> The U.S. Secretary of Transportation, under authority granted by the Highway Safety Act of 1966, decreed that traffic control devices on all public streets and highways ~~open to public travel~~ (and privately owned and maintained roads or commercial establishments, if the particular city or county enacts an ordinance or resolution to this effect), in accordance with 23 U.S.C. 109(d) and 402(a) in each State shall be in substantial conformance with the Standards issued or endorsed by the FHWA.**

Support:

<sup>08</sup> The “Uniform Vehicle Code (UVC)” is one of the publications referenced in the MUTCD. The UVC contains a model set of motor vehicle codes and traffic laws for use throughout the United States.

Guidance:

<sup>09</sup> *The States should adopt Section 15-116 of the UVC, which states that, “No person shall install or maintain in any area of private property used by the public any sign, signal, marking, or other device intended to regulate, warn, or guide traffic unless it conforms with the State manual and specifications adopted under Section 15-104.”*

Support:

<sup>10</sup> The Standard, Guidance, Option, and Support material described in this edition of the MUTCD provide the transportation professional with the information needed to make appropriate decisions regarding the use of traffic control devices on streets, highways, and bikeways, ~~and private roads open to public travel (see definition in Section 1A.13).~~

<sup>11</sup> Throughout this Manual the headings Standard, Guidance, Option, and Support are used to classify the nature of the text that follows. Figures and tables, including the notes contained therein, supplement the text and might constitute a Standard, Guidance, Option, or Support. The user needs to refer to the appropriate text to classify the nature of the figure, table, or note contained therein.

<sup>11a</sup> The figures shown in the California MUTCD are typical or example applications of the traffic control devices to illustrate their use and manner. Criteria for position, location, and use of traffic control devices in the figures are furnished solely for the purpose of guidance, understanding and information, and are not a legal standard. Engineering judgment must be used to apply these guidelines to the typical or example applications, or adjust them to fit individual field site conditions. The California MUTCD is not intended to be a substitute for engineering knowledge, experience or judgment.

**Standard:**

<sup>12</sup> **When used in this Manual, the text headings of Standard, Guidance, Option, and Support shall be as defined in Paragraph 1 of Section 1A.13. For all purposes, regardless of the text heading, any sentence containing the verb shall or MUTCD text edited to the verb shall, shall be considered a Standard. Similarly, any sentence containing the verb should or MUTCD text edited to the verb should, shall be considered Guidance and any sentence containing the verb may or MUTCD text edited to the verb may, shall be considered an Option.**

Support:

<sup>13</sup> Throughout this Manual all dimensions and distances are provided in English units. Appendix A2 contains tables for converting each of the English unit numerical values that are used in this Manual to the equivalent Metric (International System of Units) values.

Guidance:

<sup>14</sup> *If Metric units are to be used in laying out distances or determining sizes of devices, such units should be specified on plan drawings and made known to those responsible for designing, installing, or maintaining traffic control devices.*

<sup>14a</sup> *In 1993, the Department had adopted the International System of Units as the preferred system of weights and measures to comply with federal law. The law was subsequently changed making the use of the Metric System optional. The Department made the decision in 2004 to readopt the U.S. Customary (English) system of units and measures as the preferred system. Guidance on the use of the Metric and U.S. Customary Systems of Measurement is available from Department of Transportation's Division of Design, Metric Program.*

<sup>15</sup> *Except when a specific numeral is required or recommended by the text of a Section of this Manual, numerals displayed on the images of devices in the figures that specify quantities such as times, distances, speed limits, and weights should be regarded as examples only. When installing any of these devices, the numerals should be appropriately altered to fit the specific situation.*

Support:

<sup>16</sup> The following information will be useful when reference is being made to a specific portion of text in this Manual.

<sup>17</sup> There are nine Parts in this Manual and each Part is comprised of one or more Chapters. Each Chapter is comprised of one or more Sections. Parts are given a numerical identification, such as Part 2 – Signs. Chapters are identified by the Part number and a letter, such as Chapter 2B – Regulatory Signs, Barricades, and Gates. Sections are identified by the Chapter number and letter followed by a decimal point and a number, such as Section 2B.03 – Size of Regulatory Signs.

<sup>18</sup> Each Section is comprised of one or more paragraphs. The paragraphs are indented and are identified by a number. Paragraphs are counted from the beginning of each Section without regard to the intervening text headings (Standard, Guidance, Option, or Support). Some paragraphs have lettered or numbered items. As an example of how to cite this Manual, the phrase “Not less than 40 feet beyond the stop line” that appears in Section 4D.14 of this Manual would be referenced in writing as “Section 4D.14, P1, A.1,” and would be verbally referenced as “Item A.1 of Paragraph 1 of Section 4D.14.”

<sup>18a</sup> The California MUTCD uses a format similar to the MUTCD. It incorporates FHWA's MUTCD in its entirety and explicitly shows which portions thereof are applicable or not applicable in California. The unedited MUTCD text is shown in “Times New Roman” font with black color. The California edited MUTCD text is also shown in “Times New Roman” font with black color but with strikethrough of all text portions that are not applicable in California and a blue margin line for easier distinction between the two types of MUTCD texts. The California text additions and enhancements are incorporated into the combined document at appropriate locations and shown in an “Arial Narrow” font with blue color and a blue margin line on the right to keep them distinct from the MUTCD content, when the pages are viewed on a computer monitor, or as hard copies in color or as black photocopies. California added paragraphs are shown in “Arial Narrow” font with blue color.

<sup>18b</sup> All MUTCD figures and tables, or portions thereof, which are not applicable in California, are shown with appropriate size blue X cross-outs. The MUTCD figures and tables that have been modified or added to, in the California MUTCD retain the same MUTCD Figure or Table number but include “(CA)” to indicate that it is the California version of the MUTCD Figure or Table. For example:

- A. Figure 3B-18(CA) Do Not Block Intersection Markings
- B. Table 2H-1(CA) California General Information Sign Sizes

<sup>18c</sup> For California topics where there is no corresponding section, figure or table in the MUTCD, the California MUTCD gives a number that begins with the number 101 for that section, figure or table and increases in sequence, followed with a “(CA)” to indicate that this is a California created section, figure or table number. For example:

- A. Section 4D.105(CA) – Bicycle/Motorcycle Detection
- B. Figure 6H-103(CA) – Detour for Bike Lane on Roads with Closure of One Travel Direction
- C. Table 4D-102(CA) – Minimum Yellow Change Interval Timing

<sup>18d</sup> The California MUTCD contents within each chapter (Chapter 2B shown as example below) appear in a consistent order for ease of reference. This sequence is as follows:

- A. MUTCD Sections per sequential numbering. For example, Sections 2B.01 through 2B.68.
- B. California Sections per sequential numbering. For example, Sections 2B.101(CA) through 2B.111(CA).
- C. MUTCD Figures (including edited and deleted) per sequential numbering. For example, Figures 2B-1 through 2B-32.
- D. California Figures based upon or modifying MUTCD Figures are placed immediately after the respective MUTCD figure. For example, Figure 2B-12(CA) follows immediately after the deleted MUTCD Figure 2B-12 it replaces. Another example is Figure 2B-10(CA) which immediately follows MUTCD (undeleted) Figure 2B-10 as the California figure supplements the MUTCD Figure, it does not replace it.
- E. California Figures that are stand alone and not based upon MUTCD Figures follow in sequence per their numbering. For example, Figures 2B-101(CA) through 2B-106(CA) follow after the end of MUTCD numbered figures.
- F. MUTCD and California Tables follow the Figures under similar rules described above for the figures.

**Standard:**

<sup>19</sup> **In accordance with 23 CFR 655.603(b)(3), States or other Federal agencies that have their own MUTCDs or Supplements shall revise these MUTCDs or Supplements to be in substantial conformance with changes to the National MUTCD within 2 years of the effective date of the Final Rule for the changes. Substantial conformance of such State or other Federal agency MUTCDs or Supplements shall be as defined in 23 CFR 655.603(b)(1).**

<sup>20</sup> **After the effective date of a new edition of the MUTCD or a revision thereto, or after the adoption thereof by the State, whichever occurs later, new or reconstructed devices installed shall be in compliance with the new edition or revision.**

<sup>21</sup> **In cases involving Federal-aid projects for new highway or bikeway construction or reconstruction, the traffic control devices installed (temporary or permanent) shall be in conformance with the most recent edition of the National MUTCD before that highway is opened or re-opened to the public for unrestricted travel [23 CFR 655.603(d)(2) and (d)(3)].**

**22 Unless a particular device is no longer serviceable, non-compliant devices on existing highways and bikeways shall be brought into compliance with the current edition of the National MUTCD as part of the systematic upgrading of substandard traffic control devices (and installation of new required traffic control devices) required pursuant to the Highway Safety Program, 23 U.S.C. §402(a). The FHWA has the authority to establish other target compliance dates for implementation of particular changes to the MUTCD [23 CFR 655.603(d)(1)]. These target compliance dates established by the FHWA shall be as shown in Table I-2.**

**23 Except as provided in Paragraph 24, when a non-compliant traffic control device is being replaced or refurbished because it is damaged, missing, or no longer serviceable for any reason, it shall be replaced with a compliant device.**

Option:

<sup>24</sup> A damaged, missing, or otherwise non-serviceable device that is non-compliant may be replaced in kind if engineering judgment indicates that:

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

**Standard:**

**25 Unless allowed per the Option below, in cases involving new highway or bikeway construction or reconstruction, the traffic control devices installed (temporary or permanent) shall be in conformance with the current edition of the California MUTCD before that highway is opened or re-opened to the public for unrestricted travel pursuant to the California Vehicle Code 21401.**

Option:

<sup>26</sup> In cases involving new highway or bikeway construction or reconstruction, the traffic control devices installed (temporary or permanent) may be in accordance with previous traffic control device standards of January 21, 2010 or September 26, 2006 California MUTCD or prior to that of MUTCD 2003 and MUTCD 2003 California Supplement or Caltrans Traffic Manual, if in the judgment of the engineer, incorporating the California MUTCD standards would impose a significant delay or a significant increase in costs for the project.

Support:

<sup>27</sup> Reconstruction, as used in the previous Standard and Option topics, for the purpose of a traffic control device would mean if a particular device is modified in any form or shape or is relocated. If a reconstruction project does not modify or relocate a traffic control device, although encouraged, there would be no obligation to upgrade the traffic control device per current edition of the California MUTCD standards.

**Standard:**

**28 Unless allowed per the option below, non-compliant traffic control devices on existing highways and bikeways shall be brought into compliance with the California MUTCD as part of the systematic upgrading of substandard traffic control devices (and installation of new required traffic control devices) required pursuant to the California Vehicle Code 21401.**

Option:

<sup>29</sup> All traffic control devices on existing highways and bikeways that have become non-compliant per California MUTCD adopted standards may remain in service through the end of their useful service life, unless identified specifically with a target compliance date per Table I-101(CA).

<sup>30</sup> To limit financial impact on agencies and for fiscal responsibility reasons, existing inventory of non-compliant traffic control devices, except those identified per Table I-101(CA), may continue to be used until these inventories are depleted.

Support:

<sup>31</sup> The signs listed in Table I-101(CA) are non-compliant per this California MUTCD and have been singled out for specific target compliance dates by the California Traffic Control Devices Committee and California Department of Transportation.

<sup>32</sup> Failure to replace a sign listed in Table I-101(CA) by its target compliance date does not reduce the effectiveness of the sign to impart information to the road user.

<sup>33</sup> For ease of reference, Figure I-101(CA) shows the sign sketches of the deleted signs that have target compliance dates.

**Standard:**

<sup>34</sup> The signs listed in Table I-101(CA), although used in the past, shall no longer be used in California. Further, any such signs on existing highways and bikeways shall be removed, and replaced if appropriate, by the target compliance dates shown in Table I-101(CA).

**Table I-1. 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 Highways (MUTCD)	2/39
1942	Manual on Uniform Traffic Control Devices for Streets and Highways — War Emergency Edition	No revisions
1948	Manual on Uniform Traffic Control Devices for Streets and Highways	9/54
1961	Manual on Uniform Traffic Control Devices for Streets and Highways	No revisions
1971	Manual on Uniform Traffic Control Devices for Streets and Highways	11/71, 4/72, 3/73, 10/73, 6/74, 6/75, 9/76, 12/77
1978	Manual on Uniform Traffic Control Devices for Streets and Highways	12/79, 12/83, 9/84, 3/86
1988	Manual on Uniform Traffic Control Devices for Streets and Highways	1/90, 3/92, 9/93, 11/94, 12/96, 6/98, 1/00
2000	Manual on Uniform Traffic Control Devices for Streets and Highways — Millennium Edition	7/02
2003	Manual on Uniform Traffic Control Devices for Streets and Highways	11/04, 12/07
2009	Manual on Uniform Traffic Control Devices for Streets and Highways	

**Table I-1(CA) Evolution of the California MUTCD**

Year	Name
1955	Planning Manual of Instructions, Part 8 – Traffic Department of Public Works, Division of Highways
1972	Traffic Manual Department of Public Works, Division of Highways
1996	Traffic Manual (Metric Version) Department of Transportation, Division of Traffic Operations
2004	FHWA's MUTCD 2003 & MUTCD 2003 California Supplement Department of Transportation, Division of Traffic Operations
2006	California MUTCD Department of Transportation, Division of Traffic Operations
2010	California MUTCD (including Revisions. 1 and 2 of FHWA's MUTCD 2003) Department of Transportation, Division of Traffic Operations
2012	California MUTCD (including FHWA's MUTCD 2009) Department of Transportation, Division of Traffic Operations

**Table I-2. Target Compliance Dates Established by the FHWA (Sheet 1 of 3)**

2009 MUTCD Section Number(s)	2009 MUTCD Section Title	Specific Provision	Compliance Date
2A.08	Minimum Retroreflectivity Levels	Implementation and continued use of an assessment or management method that is designed to maintain traffic sign retroreflectivity at or above the established minimum levels	January 22, 2012 (c)
2A.08	Minimum Retroreflectivity Levels	Replacement of regulatory, warning, and post-mounted guide (except street name) signs that are identified using the assessment or management method as failing to meet the established minimum levels	January 22, 2015 (c)
2A.08	Minimum Retroreflectivity Levels	Replacement of street name signs and overhead guide signs that are identified using the assessment or management method as failing to meet the established minimum levels.	January 22, 2018 (c)
2A.19	Lateral Offset	Crashworthiness of sign supports on roads with posted speed limit of 50 mph or higher	January 17, 2013 (a)
2B.03	Size of Regulatory Signs	Increased sign sizes and other 2003 MUTCD revisions to Table 2B-1 (*)	December 22, 2013 (b)
2B.09	YIELD Sign Applications	Changes in YIELD sign application criteria from the 1988 MUTCD to the 2003 MUTCD (*)	January 17, 2011 (a)
2B.10	STOP Sign or YIELD Sign Placement	Signs mounted on the back of STOP or YIELD signs should not obscure shape of STOP sign, with exception for DO NOT ENTER signs (2003 MUTCD Sections 2B.06 and 2B.10) (*)	December 22, 2013 (b)
2B.11	Yield Here To Pedestrians Signs and Stop Here For Pedestrians Signs (R1-5 Series)	New Section 2B.11 in the 2003 MUTCD (*)	December 22, 2013 (b)
2B.13	Speed Limit Sign (R2-1)	Color of changeable message legend of YOUR SPEED legend	December 22, 2013 (b)
2B.26	Reversible Lane Control Signs (R3-9e through R3-9i)	Removal of the R3-9e and R3-9e signs that had been included in the 2000 MUTCD (2003 MUTCD Section 2B.25)	December 22, 2013 (b)
2B.40	ONE WAY Signs (R6-1, R6-2)	New requirement in the 2009 MUTCD for the number and locations of ONE WAY signs	December 31, 2019
2B.55	Photo-Enforced Signs and Plaques (R10-18, R10-19P, R10-19aP)	New signs (2003 MUTCD Section 2B.46) (*)	December 22, 2013 (b)
2C.04	Size of Warning Signs	New sizes in the 2003 MUTCD for the W1 Series arrow signs, the W12-2a low clearance signs, the W7 Series runaway truck signs, and the W10-1 advance grade crossing sign (*)	December 22, 2013 (b)
2C.06 thru 2C.14	Horizontal Alignment Warning Signs	Revised requirements in the 2009 MUTCD regarding the use of various horizontal alignment signs	December 31, 2019
2C.13	Truck Rollover Warning Sign (W1-13)	New W1-13 sign (2003 MUTCD Section 2C.11)	December 22, 2013 (b)
2C.20	NARROW BRIDGE Sign (W5-2)	Elimination of symbol sign (2003 MUTCD Section 2C.16)	December 22, 2013 (b)
2C.30	PAVEMENT ENDS Sign (W8-3)	Removal of symbol sign (2000 MUTCD Section 2C.23)	January 17, 2011 (a)
2C.38	Reduced Speed Limit Ahead Signs (W3-5, W3-5a)	Removal of R2-5 Series Reduced Speed Ahead signs and use of W3-5 or W3-5a warning signs instead (2003 MUTCD Section 2C.30)	December 22, 2018 (b)
2C.40	Merge Signs (W4-1, W4-5)	New Entering Roadway Merge sign (W4-5) (2003 MUTCD Section 2C.31)	December 22, 2013 (b)
2C.41	Added Lane Signs (W4-3, W4-6)	New Entering Roadway Added Lane sign (W4-6) (2003 MUTCD Section 2C.32)	December 22, 2013 (b)
2C.42	Lane Ends Signs (W4-2, W9-1, W9-2)	New design of W4-2 sign (2003 MUTCD Section 2C.33)	December 22, 2013 (b)
2C.46	Intersection Warning Signs (W2-1 through W2-8)	New design of Circular Intersection (W2-6) sign (2003 MUTCD Section 2C.37)	December 22, 2013 (b)
2C.49	Vehicular Traffic Warning Signs	New symbol signs W11-1, W11-5, W11-5a, W11-6, W11-11, and W11-14 (2003 MUTCD Section 2C.40)	December 22, 2013 (b)

**Table I-2. Target Compliance Dates Established by the FHWA (Sheet 2 of 3)**

2009 MUTCD Section Number(s)	2009 MUTCD Section Title	Specific Provision	Compliance Date
2C.50	Non-Vehicular Warning Signs	Elimination of crosswalk lines from crossing signs and use of diagonal downward pointing arrow (W16-7P) supplemental plaque if at the crossing (2003 MUTCD Section 2C.41)	January 17, 2011 (a)(b)
2C.61	PHOTO ENFORCED Plaque (W16-10P)	New plaque (2003 MUTCD Section 2C.53) (*)	December 22, 2013 (b)
2C.63	Object Marker Design and Placement Height	Width of stripes on Type 3 striped marker (2003 MUTCD Section 3C.01)	December 22, 2013 (b)
2D.43	Street Name Signs (D3-1 or D3-1a)	6-inch letter height for lettering on post-mounted Street Name signs (except on multi-lane streets with speed limits greater than 40 mph) (2000 MUTCD Section 2D.38)	January 9, 2012 (a)
2D.43	Street Name Signs (D3-1 or D3-1a)	8-inch letter height on post-mounted signs on multi-lane streets with speed limits greater than 40 mph and 12-inch letter height on overhead signs (2003 MUTCD Section 2D.38)	December 22, 2018 (b)
2D.44	Advance Street Name Signs (D3-2)	Requirements of new Section 2D.39 in the 2003 MUTCD	December 22, 2018 (b)
2D.45	Signing on Conventional Roads on Approaches to Interchanges	New requirement in the 2009 MUTCD for multi-lane approaches to interchanges to have guide signs to identify which direction of turn is to be made for access to each direction of the freeway or expressway	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
2G.01 through 2G.07	Regulatory Signs for Preferential Lanes	Requirements for regulatory signs for preferential lanes (2003 MUTCD Sections 2B.26 through 2B.28) (*)	December 22, 2013 (b)
2G.11 through 2G.15	Preferential Lane Guide Signs	New Section 2E.59 in the 2003 MUTCD (*)	December 22, 2013 (b)
2H.02, 2H.03	Reference Location Signs, Intermediate Reference Location Signs, and Enhanced Reference Location Signs	Location and spacing of Reference Location signs and design of Intermediate Reference Location signs (2003 MUTCD Sections 2D.46 and 2E.54)	December 22, 2013 (b)
2I.07	Radio Information Signing	New Channel 9 Monitored (D12-3) sign (2003 MUTCD Section 2D.45)	December 22, 2013 (b)
2I.08	TRAVEL INFO CALL 511 Signs (D12-5 and D12-5a)	New TRAVEL INFO CALL 511 Sign (D12-5) (2003 MUTCD Section 2D.45)	December 22, 2013 (b)
2J.05	Size of Lettering	Minimum height of letters and numerals on Specific Service signs (2000 MUTCD Section 2F.05)	January 17, 2011 (a)
2N.03	Evacuation Route Signs (EM-1 and EM-1a)	New design and size of EM-1 sign (2003 MUTCD Section 2I.03)	December 22, 2018 (b)
3B.04, 3B.05	White Longitudinal Pavement Markings	New requirement in the 2009 MUTCD for dotted lane lines for dropped lanes and for acceleration, deceleration, and auxiliary lanes	December 31, 2016 or resurfacing, whichever occurs first
3B.18	Crosswalk Markings	Gap between transverse lines of a crosswalk (2003 MUTCD Section 3B.17)	December 22, 2013 (b)
4D.01	General	Location of signalized midblock crosswalks	December 22, 2013 (b)
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	December 31, 2014, or when timing adjustments are made to the individual intersection and/or corridor, whichever occurs first
4D.31	Flashing Operation—Transition Out of Flashing Mode	Duration of steady red clearance interval in change from red-red flashing mode to steady (stop-and-go) mode (2003 MUTCD Section 4D.12)	December 22, 2013 (b)
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	December 31, 2014, or when timing adjustments are made to the individual intersection and/or corridor, whichever occurs first
4E.07	Countdown Pedestrian Signals	Pedestrian countdown hardware requirements	December 22, 2013 (b)

**Table I-2. Target Compliance Dates Established by the FHWA (Sheet 3 of 3)**

2009 MUTCD Section Number(s)	2009 MUTCD Section Title	Specific Provision	Compliance Date
5C.05	NARROW BRIDGE Sign (W5-2)	Elimination of symbol sign	December 22, 2013 (b)
6D.03	Worker Safety Considerations	New requirement in the 2009 MUTCD that all workers within the right-of-way shall wear high-visibility apparel	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
7B.11	School Advance Crossing Assembly	Use of AHEAD (W16-9P) plaque or distance plaque (W16-2P or W16-2aP) (2000 MUTCD Section 7B.08)	January 17, 2011 (a)
7B.12	School Crossing Assembly	Elimination of crosswalk lines from crossing signs and use of diagonal downward pointing arrow (W16-7P) supplemental plaque (2000 MUTCD Sections 7B.08 and 7B.09)	January 17, 2011 (a)
7B.16	Reduced School Speed Limit Ahead Sign (S4-5, S4-5a)	Removal of R2-5 Series Reduced Speed Ahead signs and use of S4-5 or S4-5a warning signs instead (2003 MUTCD Section 7B.12)	December 22, 2013 (b)
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	Grade Crossing (Crossbuck) Sign (R15-1) and Number of Tracks Plaque (R15-2P) at Active and Passive Grade Crossings	Retroreflective strip on crossbuck support (2000 MUTCD Section 8B.02) (*)	January 17, 2011 (a)
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, 2013
8B.19 and 8C.02 through 8C.05	LRT Approaching-Activated Blank-Out Warning Sign, Flashing Light Signals, and Automatic Gates	Automatic gates, flashing light signals, and blank-out signs at highway-LRT crossings per Part 10 of the 2000 MUTCD (*)	January 17, 2011 (a)
8C.09	Traffic Control Signals at or Near Highway-Rail Grade Crossings	Pre-signals (2003 MUTCD Section 8D.07)	December 22, 2013 (b)
8C.12	Grade Crossings Within or In Close Proximity to Circular Intersections	New requirement in the 2009 MUTCD for study of grade crossings near roundabouts	December 31, 2014
9B.18	Bicycle Warning and Combined Bicycle/Pedestrian Signs (W11-1 and W11-15)	Elimination of crosswalk lines from crossing signs and use of diagonal downward pointing arrow (W16-7P) supplemental plaque if at the crossing (2000 MUTCD Section 9B.15)	January 17, 2011 (a)

Notes: Unless otherwise noted, dates are as established in the Final Rule for the 2009 MUTCD.  
(a) Date established in the Final Rule for the 2000 MUTCD  
(b) Date established in the Final Rule for the 2003 MUTCD  
(c) Date established in the Final Rule for Revision 2 of the 2003 MUTCD  
(\*) Provisions may have been revised in the 2009 MUTCD

**Figure I-101 (CA). Deleted California Signs with Target Compliance Dates**



**Table I-101(CA) Deleted California Signs with Target Compliance Dates**

Sign Code	Title/Description	Comment	Target Compliance Date
<del>SW27(CA)</del>	Skewed RR Crossing symbol with Motorcycle symbol	Use Skewed Crossing symbol (W10-12) sign	January 1, 2015
<del>SW27-1(CA)</del>	Skewed RR Crossing symbol with Motorcycle & Bike symbol	Use Skewed Crossing symbol (W10-12) sign	January 1, 2015
SW28(CA)	STEEL DECK with Motorcycle symbol	Use modified STEEL BRIDGE DECK (SW28 (CA)) word message sign	January 1, 2015

# PART 1 GENERAL

## CHAPTER 1A. GENERAL

### **Section 1A.01 Purpose of Traffic Control Devices**

**Support:**

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

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

**Standard:**

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

**Support:**

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

### **Section 1A.02 Principles of Traffic Control Devices**

**Support:**

01 This Manual contains the basic principles that govern the design and use of traffic control devices for all streets, highways, and bikeways, ~~and private roads open to public travel~~ (see definition in Section 1A.13) regardless of type or class or the public agency, official, or owner having jurisdiction. This Manual's text specifies the restriction on the use of a device if it is intended for limited application or for a specific system. It is important that these principles be given primary consideration in the selection and application of each device.

**Guidance:**

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

*A. Fulfill a need;*

*B. Command attention;*

*C. Convey a clear, simple meaning;*

*D. Command respect from road users; and*

*E. Give adequate time for proper response.*

03 *Design, placement, operation, maintenance, and uniformity are aspects that should be carefully considered by the engineer in order to maximize the ability of a traffic control device to meet the five requirements listed in the previous paragraph. Vehicle speed, geometrics and other relevant factors should be carefully considered as ~~an~~ elements that governs the design, operation, placement, and location of various traffic control devices.*

**Support:**

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

**Guidance:**

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

06 *The proper use of traffic control devices should provide the reasonable and prudent road user with the information necessary to efficiently and lawfully use the streets, highways, pedestrian facilities, and bikeways.*

Support:

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

### **Section 1A.03 Design of Traffic Control Devices**

*Guidance:*

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

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

Support:

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

Option:

04 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.

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

*Guidance:*

01 *Placement of a traffic control device should be within the road user's view so that adequate visibility is provided. To aid in conveying the proper meaning, the traffic control device should be appropriately positioned with respect to the location, object, or situation to which it applies. The location and legibility of the traffic control device should be such that a road user has adequate time to make the proper response in both day and night conditions.*

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

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

04 *Traffic control devices, which are used on a part-time basis, should be in operation only during the time periods that they are required.*

### **Section 1A.05 Maintenance of Traffic Control Devices**

*Guidance:*

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

02 *Physical maintenance of traffic control devices should be performed to retain the legibility and visibility of the device, and to retain the proper functioning of the device.*

Support:

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

### **Section 1A.06 Uniformity of Traffic Control Devices**

Support:

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

**Standard:**

**02 Any given device for the control of traffic shall have the same meaning and require the same action on the part of motorists regardless of where it is encountered.**

**Section 1A.07 Responsibility for Traffic Control Devices**

**Standard:**

**01 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, ~~or, in the case of private roads open to public travel, with the private owner or private 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 bikeway, ~~or private road open to public travel~~ (see definition in Section 1A.13). When a State or other Federal agency manual or supplement is required, that manual or supplement shall be in substantial conformance with the National MUTCD.**

**01a On State highways, the California MUTCD shall not supersede the Department's Standard Plans, Standard Specifications or the Special Provisions publications but all Standard statements of the California MUTCD shall be met. On State highways, whenever there is a discrepancy between the specifications and requirements contained in the California MUTCD, and those contained in the Department's Standard Plans, Standard Specifications or the Special Provisions publications, the Department's Standard Plans, Standard Specifications or the Special Provisions publications shall govern.**

**01b Nothing contained in the California MUTCD shall prevent the Department of Transportation from modifying, changing or adopting new specifications as necessary. Any revisions to the Department's Standard Plans, Standard Specifications or the Special Provisions shall conform to the Standard statements of the California MUTCD.**

**02 23 CFR 655.603 also states that traffic control devices on all streets, highways, and bikeways, ~~and private roads open to public travel~~ in each State shall be in substantial conformance with standards issued or endorsed by the Federal Highway Administrator.**

**Support:**

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

**04 The "Uniform Vehicle Code" (see Section 1A.11) 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."**

**05 All States have officially adopted the National MUTCD either in its entirety, with supplemental provisions, or as a separate published document.**

**Guidance:**

**06 These individual State manuals or supplements should be reviewed for specific provisions relating to that State.**

**Support:**

**07 The National MUTCD has also been adopted by the National Park Service, the U.S. Forest Service, the U.S. Military Command, the Bureau of Indian Affairs, the Bureau of Land Management, and the U.S. Fish and Wildlife Service.**

**Guidance:**

**08 States should adopt Section 15-116 of the "Uniform Vehicle Code," which states that, "No person shall install or maintain in any area of private property used by the public any sign, signal, marking, or other device intended to regulate, warn, or guide traffic unless it conforms with the State manual and specifications adopted under Section 15-104."**

Support:

<sup>09</sup> Pursuant to the provisions in CVC Section 21400, the Department of Transportation adopts uniform standards and specifications for all traffic control devices after consultation with local agencies and public hearings. The Department of Transportation consults with local agencies and the public through the California Traffic Control Devices Committee (CTCDC). The Department of Transportation publicizes these uniform standards and specifications for traffic control devices through the California MUTCD.

**Standard:**

<sup>10</sup> **In accordance with CVC Section 21401, only traffic control devices conforming to Department of Transportation standards and specifications shall be placed on streets and highways.**

<sup>11</sup> **Subject to the requirements in CVC Sections 21100, 21100.1, 21107, 21107.5, 21107.6, and 21107.7, no person shall install or maintain in any area of private property used by the public any sign, signal, or marking or other device intended to regulate, warn, or guide traffic unless it conforms with Department of Transportation standards and specifications.**

Support:

<sup>12</sup> The delegation of maintenance activities to local authorities is usually exercised under the authority of Streets and Highways Code Section 130.

<sup>13</sup> The Department of Transportation standards and specifications for traffic control devices are not applicable to privately owned and maintained roads or commercial establishments, unless the particular city or county enacts an ordinance or resolution to this effect. Refer to CVC Sections 21100, 21100.1, 21107, 21107.5, 21107.6, and 21107.7. However, the use of Department of Transportation standards and specifications for traffic control devices are encouraged on all privately owned and maintained roads or commercial establishments, in general, as a good practice.

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

**Standard:**

<sup>01</sup> **Traffic control devices, advertisements, announcements, and other signs or messages within the highway right-of-way shall be placed only as authorized by a public authority or the official having jurisdiction, or, in the case of private roads open to public travel, by the private owner or private official having jurisdiction, for the purpose of regulating, warning, or guiding traffic.**

<sup>02</sup> **When the public agency or the official having jurisdiction over a street or highway or, in the case of private roads open to public travel, the private owner or private official having jurisdiction, has granted proper authority, others such as contractors and public utility companies shall be permitted to install temporary traffic control devices in temporary traffic control zones. Such traffic control devices shall conform with the Standards of this Manual.**

<sup>02a</sup> **On State highways, the California MUTCD shall not supersede the Department's Standard Plans, Standard Specifications or the Special Provisions publications but all Standard statements of the California MUTCD shall be met. On State highways, whenever there is a discrepancy between the specifications and requirements contained in the California MUTCD, and those contained in the Department's Standard Plans, Standard Specifications or the Special Provisions publications, the Department's Standard Plans, Standard Specifications or the Special Provisions publications shall govern.**

<sup>02b</sup> **Nothing contained in the California MUTCD shall prevent the Department of Transportation from modifying, changing or adopting new specifications as necessary. Any revisions to the Department's Standard Plans, Standard Specifications or the Special Provisions shall conform to the Standard statements of the California MUTCD.**

<sup>03</sup> **All regulatory traffic control devices shall be supported by laws, ordinances, or regulations.**

Support:

<sup>04</sup> Provisions of this Manual are based upon the concept that effective traffic control depends upon both appropriate application of the devices and reasonable enforcement of the regulations.

<sup>05</sup> Although some highway design features, such as curbs, median barriers, guardrails, speed humps or tables, and textured pavement, have a significant impact on traffic operations and safety, they are not considered to be traffic control devices and provisions regarding their design and use are generally not included in this Manual.

<sup>06</sup> Certain types of signs and other devices that do not have any traffic control purpose are sometimes placed within the highway right-of-way by or with the permission of the public agency or the official having jurisdiction over the street or highway. Most of these signs and other devices are not intended for use by road users in

general, and their message is only important to individuals who have been instructed in their meanings. These signs and other devices are not considered to be traffic control devices and provisions regarding their design and use are not included in this Manual. Among these signs and other devices are the following:

- A. Devices whose purpose is to assist highway maintenance personnel. Examples include markers to guide snowplow operators, devices that identify culvert and drop inlet locations, and devices that precisely identify highway locations for maintenance or mowing purposes.
- B. Devices whose purpose is to assist fire or law enforcement personnel. Examples include markers that identify fire hydrant locations, signs that identify fire or water district boundaries, speed measurement pavement markings, small indicator lights to assist in enforcement of red light violations, and photo enforcement systems.
- C. Devices whose purpose is to assist utility company personnel and highway contractors, such as markers that identify underground utility locations.
- D. Signs posting local non-traffic ordinances.
- E. Signs giving civic organization meeting information.

**Standard:**

**<sup>07</sup> Signs and other devices that do not have any traffic control purpose that are placed within the highway right-of-way shall not be located where they will interfere with, or detract from, traffic control devices.**

*Guidance:*

<sup>08</sup> Any unauthorized traffic control device or other sign or message placed on the highway right-of-way by a private organization or individual constitutes a public nuisance and should be removed. All unofficial or non-essential traffic control devices, signs, or messages should be removed.

*Support:*

<sup>09</sup> California Vehicle Code (CVC) references are used throughout this California MUTCD when the subject matter relates to State law.

**Standard:**

<sup>10</sup> CVC 21400 provides that the Department of Transportation shall, after consultation with local agencies and public hearings, adopt rules and regulations prescribing uniform standards and specifications for all official traffic control devices placed pursuant to the provisions of the Code.

<sup>11</sup> CVC 21401 provides that only those official traffic control devices that conform to the uniform standards and specifications promulgated by the Department of Transportation shall be placed upon a street or highway.

<sup>12</sup> CVC 21350 and 21351 give basic authority to the Department of Transportation and local authorities, in their respective jurisdictions, to place and maintain such official traffic control devices.

*Option:*

<sup>13</sup> Local authorities may adopt rules and regulations by ordinance or resolution for regulating traffic by means of official traffic control devices meeting the requirements of CVC Section 21400. Refer to CVC Section 21100 (d).

**Standard:**

<sup>14</sup> Local agencies responsible for the development or operation of bikeways or roadways where bicycle travel is permitted shall utilize all minimum safety design criteria and uniform specifications and symbols for signs, markers, and traffic control devices established the Department of Transportation. Refer to Streets and Highways Code 891.

<sup>15</sup> The use of unauthorized traffic control devices is prohibited by CVC 21465. Prohibited traffic control devices constitute a public nuisance and shall be removed per CVC 21467. This does not modify or limit the authority of the Public Utilities Commission to erect or maintain traffic control devices as authorized by law. Refer to CVC 21468.

<sup>16</sup> Private advertising is prohibited on any highway right-of-way by Section 5403 (a) of the Business and Professions Code. "Highway" in this context includes roads, streets, boulevards, lanes, courts, places, commons, trails, ways or other rights-of-way or easements used for or laid out and intended for the public passage of vehicles or of vehicles and persons per Section 5213 of the Business and Professions Code. Also refer to CVC 360 for definition of "highway".

*Support:*

<sup>17</sup> The California Public Utilities Commission is the state regulatory agency with statutory authority over highway-rail grade crossings and highway-light rail transit grade crossings. Refer to Public Utilities Code Section 1202(a).

### **Section 1A.09 Engineering Study and Engineering Judgment**

**Support:**

01 Definitions of an engineering study and engineering judgment are contained in Section 1A.13.

01a Refer to CVC 627 for definition and requirements of "Engineering and Traffic Survey". It is also abbreviated in this manual as E&TS.

**Standard:**

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

*Guidance:*

02a *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.*

*Option:*

02b *When an engineering study or the application of engineering judgment determines that unusual site-specific conditions at a particular location make compliance with a Standard statement in this Manual impossible or impractical, an agency may deviate from that Standard statement at that location.*

03 *Early in the processes of location and design of roads and streets, engineers should coordinate such location and design with the design and placement of the traffic control devices to be used with such roads and streets.*

04 *Jurisdictions, or owners of private roads open to public travel, with responsibility for traffic control that do not have engineers on their staffs who are trained and/or experienced in traffic control devices should seek engineering assistance from others, such as the State transportation agency, their county, a nearby large city, or a traffic engineering consultant.*

**Support:**

05 As part of the Federal-aid Program, each State is required to have a Local ~~Technology~~ Technical Assistance Program (LTAP) and to provide technical assistance to local highway agencies. Requisite technical training in the application of the principles of the MUTCD is available from the State's Local ~~Technology~~ Technical Assistance Program for needed engineering guidance and assistance.

06 In California, Traffic Engineers are classified under a title act and not under a practice act. Traffic engineers can conduct studies but a Civil Engineer must sign plans for traffic control devices that will be placed in the field, per the Professional Engineers Act.

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

**Standard:**

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

**Support:**

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

**Standard:**

03 **Except as provided in Paragraph 4, requests for any interpretation, permission to experiment, interim approval, or change shall be submitted electronically to the Federal Highway Administration (FHWA), Office of Transportation Operations, MUTCD team, at the following e-mail address:**

**MUTCDofficialrequest@dot.gov.**

**Option:**

04 If electronic submittal is not possible, requests for interpretations, permission to experiment, interim approvals, or changes may instead be mailed to the

Office of Transportation Operations, HOTO-1,  
Federal Highway Administration,  
1200 New Jersey Avenue, SE,  
Washington, DC 20590.

Support:

<sup>05</sup> Communications regarding other MUTCD matters that are not related to official requests will receive quicker attention if they are submitted electronically to the MUTCD Team Leader or to the appropriate individual MUTCD team member. Their e-mail addresses are available through the links contained on the "Who's Who" page on the MUTCD website at

<http://mutcd.fhwa.dot.gov/team.htm>.

<sup>05a</sup> Requests for experimentation, interpretation, or changes relating to the California edited portion of the California MUTCD are covered later in this section.

<sup>06</sup> An interpretation includes a consideration of the application and operation of standard traffic control devices, official meanings of standard traffic control devices, or the variations from standard device designs.

Guidance:

<sup>07</sup> Requests for an interpretation of this Manual should contain the following information:

- A. A concise statement of the interpretation being sought;
- B. A description of the condition that provoked the need for an interpretation;
- C. Any illustration that would be helpful to understand the request; and
- D. Any supporting research data that is pertinent to the item to be interpreted.

Support:

<sup>08</sup> Requests to experiment include consideration of field deployment for the purpose of testing or evaluating a new traffic control device, its application or manner of use, or a provision not specifically described in this Manual.

<sup>09</sup> A request for permission to experiment will be considered only when submitted by the public agency or toll facility operator responsible for the operation of the road or street on which the experiment is to take place. For a private road open to public travel, the request will be considered only if it is submitted by the private owner or private official having jurisdiction.

<sup>10</sup> A diagram indicating the process for experimenting with traffic control devices is shown in Figure 1A-1 and 1A-1(CA).

Guidance:

<sup>11</sup> The request for permission to experiment should contain the following:

- A. A statement indicating the nature of the problem.
- B. A description of the proposed change to the traffic control device or application of the traffic control device, how it was developed, the manner in which it deviates from the standard, and how it is expected to be an improvement over existing standards.
- C. Any illustration that would be helpful to understand the traffic control device or use of the traffic control device.
- D. Any supporting data explaining how the traffic control device was developed, if it has been tried, in what ways it was found to be adequate or inadequate, and how this choice of device or application was derived.
- E. A legally binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright. (An example of a traffic control device concept would be countdown pedestrian signals in general. Ordinarily an entire general concept would not be patented or copyrighted, but if it were it would not be acceptable for experimentation unless the patent or copyright owner signs a waiver of rights acceptable to the FHWA. An example of a patented or copyrighted specific device within the general concept of countdown pedestrian signals would be a manufacturer's design for its specific brand of countdown signal, including the design details of the housing or electronics that are unique to that manufacturer's product. As long as the general concept is not patented or copyrighted, it is acceptable for experimentation to incorporate the use of one or more patented devices of one or several manufacturers.)
- F. The time period and location(s) of the experiment.
- G. A detailed research or evaluation plan that must provide for close monitoring of the experimentation, especially in the early stages of its field implementation. The evaluation plan should include before and after studies as well as quantitative data describing the performance of the experimental device.
- H. An agreement to restore the site of the experiment to a condition that complies with the provisions of this Manual within 3 months following the end of the time period of the experiment. This agreement must also provide that the agency sponsoring the experimentation will terminate the experimentation at any time that it determines significant safety concerns are directly or indirectly attributable to the experimentation. The

*FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation at any time if there is an indication of safety concerns. If, as a result of the experimentation, a request is made that this Manual be changed to include the device or application being experimented with, the device or application will be permitted to remain in place until an official rulemaking action has occurred.*

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

**Support:**

<sup>12</sup> A change includes consideration of a new device to replace a present standard device, an additional device to be added to the list of standard devices, or a revision to a traffic control device application or placement criteria.

**Guidance:**

<sup>13</sup> *Requests for a change to this Manual should contain the following information:*

- A. A statement indicating what change is proposed;*
- B. Any illustration that would be helpful to understand the request; and*
- C. Any supporting research data that is pertinent to the item to be reviewed.*

**Support:**

<sup>14</sup> Interim approval allows interim use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in this Manual. The FHWA issues an Interim Approval by official memorandum signed by the Associate Administrator for Operations and posts this memorandum on the MUTCD website. The issuance by FHWA of an interim approval will typically result in the traffic control device or application being placed into the next scheduled rulemaking process for revisions to this Manual.

<sup>15</sup> Interim approval is considered based on the results of successful experimentation, results of analytical or laboratory studies, and/or review of non-U.S. experience with a traffic control device or application. Interim approval considerations include an assessment of relative risks, benefits, costs, impacts, and other factors.

<sup>16</sup> Interim approval allows for optional use of a traffic control device or application and does not create a new mandate or recommendation for use. Interim approval includes conditions that jurisdictions agree to comply with in order to use the traffic control device or application until an official rulemaking action has occurred.

**Standard:**

<sup>17</sup> **A jurisdiction, or toll facility operator, or owner of a private road open to public travel that desires to use a traffic control device for which FHWA has issued an interim approval shall request permission from FHWA.**

**Guidance:**

<sup>18</sup> *The request for permission to place a traffic control device under an interim approval should contain the following:*

- A. A description of where the device will be used, such as a list of specific locations or highway segments or types of situations, or a statement of the intent to use the device jurisdiction-wide;*
- B. An agreement to abide by the specific conditions for use of the device as contained in the FHWA's interim approval document;*
- C. An agreement to maintain and continually update a list of locations where the device has been installed; and*
- D. An agreement to:*
  - 1. Restore the site(s) of the interim approval to a condition that complies with the provisions in this Manual within 3 months following the issuance of a final rule on this traffic control device; and*
  - 2. Terminate use of the device or application installed under the interim approval at any time that it determines significant safety concerns are directly or indirectly attributable to the device or application. The FHWA's Office of Transportation Operations has the right to terminate the interim approval at any time if there is an indication of safety concerns.*

**Option:**

<sup>19</sup> A State may submit a request for the use of a device under interim approval for all jurisdictions in that State, as long as the request contains the information listed in Paragraph 18.

**Support:**

<sup>19a</sup> Figure 1A-101(CA) shows the process for the use of traffic control devices in California approved as interim approval by FHWA.

**Guidance:**

<sup>20</sup> A local jurisdiction, toll facility operator, ~~or owner of a private road open to public travel~~ using a traffic control device or application under an interim approval that was granted by FHWA either directly or on a statewide basis based on the State's request should inform the State of the locations of such use.

<sup>21</sup> A local jurisdiction, toll facility operator, or owner of a private road open to public travel that is requesting permission to experiment or permission to use a device or application under an interim approval should first check for any State laws and/or directives covering the application of the MUTCD provisions that might exist in their State.

**Option:**

<sup>22</sup> A device or application installed under an interim approval may remain in place, under the conditions established in the interim approval, until an official rulemaking action has occurred.

**Support:**

<sup>23</sup> A diagram indicating the process for incorporating new traffic control devices into this Manual is shown in Figure 1A-2.

<sup>24</sup> For additional information concerning interpretations, experimentation, changes, or interim approvals, visit the MUTCD website at <http://mutcd.fhwa.dot.gov>.

**Standard:**

<sup>25</sup> **Requests shall be made to the FHWA for experimenting with any new traffic control device, its application or manner of use, or a provision not specifically described in the Manual on Uniform Traffic Control Devices.**

**Support:**

<sup>26</sup> In addition to the requirements of the FHWA, experimental traffic control devices are subject to the laws, regulations and policies of the State of California.

**Standard:**

<sup>27</sup> **The agency shall request and receive approval from the California Traffic Control Devices Committee and Federal Highway Administration, when needed, prior to installation of experimentation devices on public roadways in California.**

**Support:**

<sup>28</sup> For information, contact:

Secretary,  
California Traffic Control Devices Committee  
(916) 654-4715.

<sup>29</sup> The California MUTCD contains the official standards and policies of the State of California for the design, application, and placement of traffic control devices.

<sup>30</sup> Experimentation is defined as research involving the acts of testing, evaluating, analyzing or discovering the effect of a specific device, principle, supposition, etc., usually carried out in an operational context. Experimentation could also be performed in a laboratory. The request for experimentation is a submission specifically requesting approval to use a non-standard device on public roadways for purposes of gathering verification data.

<sup>31</sup> As used herein, the term "device" includes not only signs, signals, and markings, but also their application and manner of use.

**Guidance:**

<sup>32</sup> *Requests for experimentation, interpretation, or changes relating to the California edited portion of the California MUTCD should be sent to:*

Secretary,  
California Traffic Control Devices Committee – MS36  
P.O. Box 942874, Sacramento, CA-94274-0001

Support:

<sup>33</sup> The following procedures apply to requests for experimentation:

### **Submission of Projects**

<sup>34</sup> A request for permission to experiment will be considered only when submitted by the public agency or private toll facility responsible for the operation of the road or street on which the experiment is to take place.

Guidance:

<sup>35</sup> *Experimentation requests should contain the following information:*

- 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, photograph, or videos, which would help, explain the experimental device or use of this device.*
- D. *Any supporting data as to how the experimental device was developed, if it has been tried, in what ways it was found to be adequate or inadequate, and how was this choice of device or application arrived at.*

Support:

<sup>36</sup> Requests for experimentation that are submitted without an explanation of the objective, scope, and duration will be returned to the originator for amplification.

### **Procedure for Processing Requests**

- A. All requests for experimentation will be reviewed by the Secretary of the California Traffic Control Devices Committee to determine whether other related experimentation has been scheduled, in process, or already completed.
- B. The Secretary of the California Traffic Control Devices Committee will list the experimentation proposal on the next Committee agenda for review and approval. The Committee's approval would also include the specific guidelines to be followed for the experimentation.
- C. Action by the California Traffic Control Devices Committee on any request for experimental use of a non-conforming device could take several forms:
  1. Approval of the device for limited use on an experimental project.
  2. Approval of the device for limited use in a formal research project.
  3. Disapproval until such time as satisfactory research or other justification is submitted.
  4. Disapproval.
- D. After action by the California Traffic Control Devices Committee, the Secretary of the California Traffic Control Devices Committee will notify the originating party of its decision. If approved, the originating parties will be requested to submit a status report on the experimental testing at appropriate intervals. When the results of experimentation are completed, a final report will be prepared and forwarded to the Secretary for Committee review.
- E. The agency receiving approval for experimentation must agree to faithfully follow the specific guidelines for the experimentation, must forward reports as indicated, and must agree to terminate the experimentation upon notification.

### **Specific Guidelines for Experimental Proposal**

Guidance:

<sup>37</sup> *A specific proposal should be submitted for each request.*

Support:

<sup>38</sup> This proposal can be submitted with the initial request or could be a follow-up to specific comments by the California Traffic Control Devices Committee. The proposal, after approval by the Committee, will become an integral part of the approved experimentation.

Guidance:

<sup>39</sup> *Each proposal should include:*

- A. Scope: *A detailed description of the experimentation, locations of installation, and number of experimental projects.*
- B. Work Plan: *A description of the proposed plan of study; the variables that are to be measured; the criteria against which the devices is to be evaluated; observations, measures and data which will be collected; whether the experimentation will be carried out in the field or under laboratory conditions; how installations of the experimental device or application will be made; the indication if any adverse effects on safety or traffic operations can be anticipated, together with the means that may be taken to minimize them; and the factors which will be held constant or measured and controlled in order to ensure that the true effects of the device are measured.*
- C. Time Periods: *Time periods for experimentation will normally not be less than six months nor more than two years.*

- D. Evaluation Procedures: The California Traffic Control Devices Committee will approve criteria, which will be used to evaluate experimental devices or applications. To permit meaningful comparisons with standard installations, advice from specialists such as human factor experts, statisticians, etc., could be included.
- E. Reporting: A written status report must be forwarded to the sponsor 45 days prior to each public meeting. A final report must be completed within 90 days of the terminal date of the experimentation and forwarded to the Secretary of the California Traffic Control Devices Committee. Status reports will describe the progress of the work, any particular deviation from the work plan and anticipated time of conclusion. The final report will contain, as a minimum, the basic information on the problem, the preliminary investigations, the proposed solutions, the study procedures, the detailed analysis of the data, the results of the work, a discussion of the results, and whatever conclusions are drawn. If a change in the California MUTCD is proposed, the recommended text (wording) for the California MUTCD should be included.
- F. Administration: All experimentation proposals will include the agency sponsoring the study, the agency conducting the study, and the name and titles of principal researchers. There must be proof of professional traffic engineering capabilities and other related professional expertise to perform the experimentation and related evaluation processes.

#### Termination of Experimentation

##### **Standard:**

<sup>40</sup> **The project shall terminate at the end of the approved period unless an extension is granted, and all experimental devices and applications shall be removed unless specific permission is given for continued operation.**

##### **Support:**

<sup>41</sup> The California Traffic Control Devices Committee could, at any time, terminate approval of experimentation if significant safety hazards are indicated to be directly or indirectly attributable to the experimentation. Approval of any experimentation could also be terminated if no status report is received 45 days prior to each public meeting or no final report is received within 90 days of the terminal date of the experimentation.

#### Removal of Experimentation Installations

##### **Standard:**

<sup>42</sup> **All experimentation installations shall be removed upon termination of the experiment-when a decision is made by the California Traffic Control Devices Committee that the device is not warranted.**

##### **Support:**

<sup>43</sup> Authority and reference cited for removal of experimentation installation is CVC Section 21400.

### **Section 1A.11 Relation to Other Publications**

#### **Standard:**

<sup>01</sup> **To the extent that they are incorporated by specific reference, the latest editions of the following publications, or those editions specifically noted, shall be a part of this Manual: “Standard Highway Signs and Markings” book (FHWA); and “Color Specifications for Retroreflective Sign and Pavement Marking Materials” (appendix to subpart F of Part 655 of Title 23 of the Code of Federal Regulations).**

#### **Support:**

<sup>02</sup> The “Standard Highway Signs and Markings” book includes standard alphabets and symbols and arrows for signs and pavement markings.

<sup>03</sup> For information about the publications mentioned in Paragraph 1, visit the Federal Highway Administration’s MUTCD website at

<http://mutcd.fhwa.dot.gov>,

or write to the

FHWA,  
1200 New Jersey Avenue, SE, HOTO,  
Washington, DC 20590.

<sup>04</sup> 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)

**Standard:**

**<sup>05</sup> The latest edition of Department of Transportation's California Sign Specifications shall be a part of this manual.**

**Support:**

<sup>06</sup> The latest version of other documents that are useful sources of information with respect to the use of this Manual are listed below. See the Introduction Part of this California MUTCD for ordering information for the following publications:

1. "California Building Standards Code" (California Building Standards Commission)
2. "California Business and Professions Code" (State of California)
3. "California Code of Regulations" (State of California)
4. "California Education Code" (State of California)
5. "California Government Code" (State of California)
6. "California Health and Safety Code" (State of California)
7. "California Streets and Highways Code" (State of California)
8. "California Vehicle Code" (CVC) (Department of Motor Vehicles)
9. "Construction Manual" (Department of Transportation)
10. "Highway Design Handbook For Older Drivers And Pedestrians" (Federal Highway Administration)
11. "Highway Design Manual" (Department of Transportation)
12. "High Occupancy Vehicle Guidelines for Planning, Design, and Operations" (Department of Transportation)
13. "Historic Highway Bridges of California" (Department of Transportation)
14. "Maintenance Manual" (Department of Transportation)
15. "Manual for Encroachment Permits on California State Highways" (Department of Transportation)
16. "Plans, Specifications and Estimates Guide" (PS&E) (Department of Transportation)
17. "Project Development Procedures Manual" (Department of Transportation)
18. "Ramp Meter Design Manual" (Department of Transportation)
19. "Ready to List and Construction Contract Award Guide" (Department of Transportation)
20. "Signal, Lighting and Electrical System Design Guide" (Department of Transportation)
21. "Standard Plans" (Department of Transportation)
22. "Standard Specifications" (Department of Transportation)
23. "Standard Special Provisions" (Department of Transportation)
24. "Transportation Management Plan Guidelines" (Department of Transportation)
25. "Traffic Engineering Metric Conversion Factors" (American Association of State Highway and transportation Officials - AASHTO).
26. "Traffic Manual" (Department of Transportation)

**Section 1A.12 Color Code**

**Support:**

<sup>01</sup> 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. ~~Standard statements shall not be modified or compromised based on engineering judgment or engineering study.~~**
- 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.**

02 **Unless otherwise defined in this Section, or in other Parts of this Manual, words or phrases shall have the meaning(s) as defined in the most recent editions of the “Uniform Vehicle Code,” “AASHTO Transportation Glossary (Highway Definitions),” “California Vehicle Code” and other publications mentioned in Section 1A.11.**

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

- 1. Accessible Pedestrian Signal—a device that communicates information about pedestrian signal timing in non-visual format such as audible tones, speech messages, and/or vibrating surfaces.**
- 2. Accessible Pedestrian Signal Detector—a device designated to assist the pedestrian who has visual or physical disabilities in activating the pedestrian phase.**

3. **Active Grade Crossing Warning System**—the flashing-light signals, with or without warning gates, together with the necessary control equipment used to inform road users of the approach or presence of rail traffic at grade crossings.
4. **Actuated Operation**—a type of traffic control signal operation in which some or all signal phases are operated on the basis of actuation.
5. **Actuation**—initiation of a change in or extension of a traffic signal phase through the operation of any type of detector.
6. **Advance Preemption**—the notification of approaching rail traffic that is forwarded to the highway traffic signal controller unit or assembly by the railroad or light rail transit equipment in advance of the activation of the railroad or light rail transit warning devices.
7. **Advance Preemption Time**—the period of time that is the difference between the required maximum highway traffic signal preemption time and the activation of the railroad or light rail transit warning devices.
8. **Advisory Speed**—a recommended speed for all vehicles operating on a section of highway and based on the highway design, operating characteristics, and conditions.
9. **Alley**—a street or highway intended to provide access to the rear or side of lots or buildings in urban areas and not intended for the purpose of through vehicular traffic. Refer to CVC 110, for definition of "Highway".
10. **Altered Speed Zone**—a speed limit, other than a statutory speed limit, that is based upon an engineering study. Refer to CVC 22357 and 22358.
11. **Approach**—all lanes of traffic moving toward an intersection or a midblock location from one direction, including any adjacent parking lane(s).
12. **Arterial Highway (Street)**—a general term denoting a highway primarily used by through traffic, usually on a continuous route or a highway designated as part of an arterial system.
13. **Attended Lane (Manual Lane)**—a toll lane adjacent to a toll booth occupied by a human toll collector who makes change, issues receipts, and perform other toll-related functions. Attended lanes at toll plazas typically require vehicles to stop to pay the toll.
14. **Automatic Lane**—see Exact Change Lane.
15. **Average Annual Daily Traffic (AADT)**—the total volume of traffic passing a point or segment of a highway facility in both directions for one year divided by the number of days in the year. Normally, periodic daily traffic volumes are adjusted for hours of the day counted, days of the week, and seasons of the year to arrive at average annual daily traffic.
16. **Average Daily Traffic (ADT)**—the average 24 hour volume, being the total volume during a stated period divided by the number of days in that period. Normally, this would be periodic daily traffic volumes over several days, not adjusted for days of the week or seasons of the year.
17. **Average Day**—a day representing traffic volumes normally and repeatedly found at a location, typically a weekday when volumes are influenced by employment or a weekend day when volumes are influenced by entertainment or recreation.
18. **Backplate**—see Signal Backplate.
19. **Barrier-Separated Lane**—a preferential lane or other special purpose lane that is separated from the adjacent general-purpose lane(s) by a physical barrier.
20. **Beacon**—a highway traffic signal with one or more signal sections that operates in a flashing mode.
21. **Bicycle**—a pedal-powered vehicle upon which the human operator sits. As per CVC 231, a bicycle is a device upon which any person may ride, propelled exclusively by human power through a belt, chain, or gears, and having one or more wheels. Persons riding bicycles are subject to the provisions of this code specified in Sections 21200 and 21200.5. Also refer to CVC 39000 and S&H Code Section 890.2.
22. **Bicycle Facilities**—a general term denoting improvements and provisions that accommodate or encourage bicycling, including parking and storage facilities, and shared roadways not specifically defined for bicycle use.
23. **Bicycle Lane**—a portion of a roadway that has been designated for preferential or exclusive use by bicyclists by pavement markings and, if used, signs. See Class II Bikeway.
- 23a. **Bicycle Path – A "bicycle path" or "bike path" is a Class I bikeway, as defined in subdivision (a) of Section 890.4 of the Streets and Highways Code. Refer to CVC 231.5. See Class I Bikeway.**

- 23b. **Bicycle Path Crossing** - That portion of a roadway included within the prolongation or connection of the boundary lines of a bike path at intersections where the intersecting roadways meet at approximately right angles or any portion of a roadway distinctly indicated for bicycle crossing by lines or other markings on the surface. Refer to CVC 231.6.
- 24. **Bikeway**—a generic term for any road, street, path, or way that in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes. **Bikeway** – All facilities that provide primarily for bicycle travel. Refer California Streets and Highways Code Section 890.4.
- 24a. **Bike Route** – See Class III Bikeway.
- 25. **Buffer-Separated Lane**—a preferential lane or other special purpose lane that is separated from the adjacent general-purpose lane(s) by a pattern of standard longitudinal pavement markings that is wider than a normal or wide lane line marking. The buffer area might include rumble strips, textured pavement, or channelizing devices such as tubular markers or traversable curbs, but does not include a physical barrier.
- 25a. **Business District** - A "business district" is that portion of a highway and the property contiguous thereto (a) upon one side of which highway, for a distance of 600 feet, 50 percent or more of the contiguous property fronting thereon is occupied by buildings in use for business, or (b) upon both sides of which highway, collectively, for a distance of 300 feet, 50 percent or more of the contiguous property fronting thereon is so occupied. A business district may be longer than the distances specified in this section if the above ratio of buildings in use for business to the length of the highway exists. Refer to CVC 235.
- 25b. **CVC** – California Vehicle Code.
- 25c. **California Sign Specifications** – Detailed drawings of signs approved by the Department of Transportation for use in California.
- 26. **Cantilevered Signal Structure**—a structure, also referred to as a mast arm, that is rigidly attached to a vertical pole and is used to provide overhead support of highway traffic signal faces or grade crossing signal units.
- 27. **Center Line Markings**—the yellow pavement marking line(s) that delineates the separation of traffic lanes that have opposite directions of travel on a roadway. These markings need not be at the geometrical center of the pavement.
- 28. **Changeable Message Sign**—a sign that is capable of displaying more than one message (one of which might be a “blank” display), changeable manually, by remote control, or by automatic control. Electronic-display changeable message signs are referred to as Dynamic Message Signs in the National Intelligent Transportation Systems (ITS) Architecture and are referred to as Variable Message Signs in the National Electrical Manufacturers Association (NEMA) standards publication.
- 29. **Channelizing Line Markings**—a wide or double solid white line used to form islands where traffic in the same direction of travel is permitted on both sides of the island.
- 30. **Circular Intersection**—an intersection that has an island, generally circular in design, located in the center of the intersection where traffic passes to the right of the island. Circular intersections include roundabouts, rotaries, and traffic circles.
- 31. **Circulatory Roadway**—the roadway within a circular intersection on which traffic travels in a counterclockwise direction around an island in the center of the circular intersection.
- 31a. **Civil Engineer** - a professional engineer in the branch of civil engineering and refers to one who practices or offers to practice civil engineering in any of its phases. Refer to California Business and Professions Code Section 6702.
- 31b. **Class I Bikeway (such as a Bike Path or a Shared-Use Path)** – Provides a completely separated right-of-way designated for the exclusive use of bicycles and pedestrians with crossflows by motorists minimized. Refer California Streets and Highways Code Section 890.4. Refer to the Department's Highway Design Manual Index 1003.1 for design criteria.
- 31c. **Class II Bikeway (such as a Bike Lane)** – Provides a restricted right-of-way designated for the exclusive or semi-exclusive use of bicycles with through travel by motor vehicles or pedestrians prohibited, but with vehicle parking and crossflows by pedestrians and motorists permitted. Refer to California Streets and Highways Code Section 890.4. Refer to the Department's Highway Design Manual Index 1003.2 for design criteria.

- 31d. **Class III Bikeway (such as a Bike Route)** – provide a right-of-way designated by signs or permanent markings and shared with pedestrians or motorists. Refer to California Streets and Highways Code Section 890.4. Refer to the Department's Highway Design Manual Index 1003.3 for design criteria.
32. **Clear Storage Distance**—when used in Part 8, the distance available for vehicle storage measured between 6 feet from the rail nearest the intersection to the intersection stop line or the normal stopping point on the highway. At skewed grade crossings and intersections, the 6-foot distance shall be measured perpendicular to the nearest rail either along the center line or edge line of the highway, as appropriate, to obtain the shorter distance. Where exit gates are used, the distance available for vehicle storage is measured from the point where the rear of the vehicle would be clear of the exit gate arm. In cases where the exit gate arm is parallel to the track(s) and is not perpendicular to the highway, the distance is measured either along the center line or edge line of the highway, as appropriate, to obtain the shorter distance.
33. **Clear Zone**—the total roadside border area, starting at the edge of the traveled way, that is available for an errant driver to stop or regain control of a vehicle. This area might consist of a shoulder, a recoverable slope, and/or a non-recoverable, traversable slope with a clear run-out area at its toe.
34. **Collector Highway**—a term denoting a highway that in rural areas connects small towns and local highways to arterial highways, and in urban areas provides land access and traffic circulation within residential, commercial, and business areas and connects local highways to the arterial highways.
35. **Concurrent Flow Preferential Lane**—a preferential lane that is operated in the same direction as the adjacent mixed flow lanes, separated from the adjacent general-purpose freeway lanes by a standard lane stripe, painted buffer, or barrier.
36. **Conflict Monitor**—a device used to detect and respond to improper or conflicting signal indications and improper operating voltages in a traffic controller assembly.
37. **Constant Warning Time Detection**—a means of detecting rail traffic that provides relatively uniform warning time for the approach of trains or light rail transit traffic that are not accelerating or decelerating after being detected.
- 37a. **Consulting Engineer** – See Professional Engineer. Refer to California Business and Professions Code Section 6704.
38. **Contiguous Lane**—a lane, preferential or otherwise, that is separated from the adjacent lane(s) only by a normal or wide lane line marking.
39. **Controller Assembly**—a complete electrical device mounted in a cabinet for controlling the operation of a highway traffic signal.
40. **Controller Unit**—that part of a controller assembly that is devoted to the selection and timing of the display of signal indications.
41. **Conventional Road**—a street or highway other than a low-volume road (as defined in Section 5A.01), expressway, or freeway.
42. **Counter-Flow Lane**—a lane operating in a direction opposite to the normal flow of traffic designated for peak direction of travel during at least a portion of the day. Counter-flow lanes are usually separated from the off-peak direction lanes by tubular markers or other flexible channelizing devices, temporary lane separators, or movable or permanent barrier.
43. **Crashworthy**—a characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the National Cooperative Highway Research Program Report 350, “Recommended Procedures for the Safety Performance Evaluation of Highway Features.”
44. **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 center line; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated as a pedestrian crossing by pavement marking lines on the surface, which might be supplemented by contrasting pavement texture, style, or color. **As per CVC 275, "Crosswalk" is either: (a) That portion of a roadway included within the prolongation or connection of the boundary lines of sidewalks at intersections where the intersecting roadways meet at approximately right**

angles, except the prolongation of such lines from an alley across a street. (b) Any portion of a roadway distinctly indicated for pedestrian crossing by lines or other markings on the surface. Notwithstanding the foregoing provisions of this section, there shall not be a crosswalk where local authorities have placed signs indicating no crossing.

45. **Crosswalk Lines**—white or yellow (in school areas per CVC 21368) pavement marking lines that identify a crosswalk.
46. **Cycle Length**—the time required for one complete sequence of signal indications.
47. **Dark Mode**—the lack of all signal indications at a signalized location. (The dark mode is most commonly associated with power failures, ramp meters, hybrid beacons, beacons, and some movable bridge signals.)
48. **Delineator**—a retroreflective device mounted on the roadway surface or at the side of the roadway in a series to indicate the alignment of the roadway, especially at night or in adverse weather.
- 48a. **Department of Transportation – California Department of Transportation or Caltrans.**
49. **Design Vehicle**—the longest vehicle permitted by statute of the road authority (State or other) on that roadway.
50. **Designated Bicycle Route**—a system of bikeways designated by the jurisdiction having authority with appropriate directional and informational route signs, with or without specific bicycle route numbers.
51. **Detectable**—having a continuous edge within 6 inches of the surface so that pedestrians who have visual disabilities can sense its presence and receive usable guidance information.
52. **Detector**—a device used for determining the presence or passage of vehicles (including motorcycles), bicycles or pedestrians.
- 52a. **Divided Highway – A highway with separated roadbeds for traffic in opposing directions.**
53. **Downstream**—a term that refers to a location that is encountered by traffic subsequent to an upstream location as it flows in an “upstream to downstream” direction. For example, “the downstream end of a lane line separating the turn lane from a through lane on the approach to an intersection” is the end of the lane line that is closest to the intersection.
54. **Dropped Lane**—a through lane that becomes a mandatory turn lane on a conventional roadway, or a through lane that becomes a mandatory exit lane on a freeway or expressway. The end of an acceleration lane and reductions in the number of through lanes that do not involve a mandatory turn or exit are not considered dropped lanes.
55. **Dual-Arrow Signal Section**—a type of signal section designed to include both a yellow arrow and a green arrow.
56. **Dynamic Envelope**—the clearance required for light rail transit traffic or a train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure (see Figure 8B-8 8B-6(CA) Sheet 1 of 3).
57. **Dynamic Exit Gate Operating Mode**—a mode of operation where the exit gate operation is based on the presence of vehicles within the minimum track clearance distance.
58. **Edge Line Markings**—white or yellow pavement marking lines that delineate the right or left edge(s) of a traveled way.
- 58a. **Electrical Engineer – a professional engineer in the branch of electrical engineering and refers to one who practices or offers to practice electrical engineering in any of its phases. Refer to California Business and Professions Code Section 6702.1.**
59. **Electronic Toll Collection (ETC)**—a system for automated collection of tolls from moving or stopped vehicles through wireless technologies such as radio-frequency communication or optical scanning. ETC systems are classified as one of the following: (1) systems that require users to have registered toll accounts, with the use of equipment inside or on the exterior of vehicles, such as a transponder or barcode decal, that communicates with or is detected by roadside or overhead receiving equipment, or with the use of license plate optical scanning, to automatically deduct the toll from the registered user account, or (2) systems that do not require users to have registered toll accounts because vehicle license plates are optically scanned and invoices for the toll amount are sent through postal mail to the address of the vehicle owner.

60. **Electronic Toll Collection (ETC) Account-Only Lane**—a non-attended toll lane that is restricted to use only by vehicles with a registered toll payment account.
61. ~~Emergency Vehicle Hybrid Beacon~~—~~a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist authorized emergency vehicles in entering or crossing a street or highway. Refer to CVC 21355.~~
62. **Emergency-Vehicle Traffic Control Signal**—a special traffic control signal that assigns the right-of-way to an authorized emergency vehicle.
63. **End-of-Roadway Marker**—a device used to warn and alert road users of the end of a roadway in other than temporary traffic control zones.
- 63a. **Engineer** – a person registered under California Professional Engineers Act as a professional engineer, including any of the branches thereof. Refer to California Business and Professions Code Section 6706.
- 63b. **Engineering and Traffic Survey** – Refer to CVC 627.
64. **Engineering Judgment**—the evaluation of available pertinent information, and the application of appropriate principles, **experience, education, discretion**, provisions, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. Engineering judgment shall be exercised by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. Documentation of engineering judgment is not required.
65. **Engineering Study**—the comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, **engineering judgment, experience, education, discretion**, provisions, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. An engineering study shall be performed by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. An engineering study shall be documented.
66. **Entrance Gate**—an automatic gate that can be lowered across the lanes approaching a grade crossing to block road users from entering the grade crossing.
67. **Exact Change Lane (Automatic Lane)**—a non-attended toll lane that has a receptacle into which road users deposit coins totaling the exact amount of the toll. Exact Change lanes at toll plazas typically require vehicles to stop to pay the toll.
68. **Exit Gate**—an automatic gate that can be lowered across the lanes departing a grade crossing to block road users from entering the grade crossing by driving in the opposing traffic lanes.
69. **Exit Gate Clearance Time**—for Four-Quadrant Gate systems at grade crossings, the amount of time provided to delay the descent of the exit gate arm(s) after entrance gate arm(s) begin to descend.
70. **Exit Gate Operating Mode**—for Four-Quadrant Gate systems at grade crossings, the mode of control used to govern the operation of the exit gate arms.
71. **Expressway**—a divided highway with partial control of access. **As per CVC 314, an "expressway" is a portion of highway that is part of either of the following: (a) An expressway system established by a county under Section 941.4 of the Streets and Highways Code. (b) An expressway system established by a county before January 1, 1989, as described in subdivision (g) of Section 941.4 of the Streets and Highways Code.**
72. **Flagger**—a person who actively controls the flow of vehicular traffic into and/or through a temporary traffic control zone using hand-signaling devices or an Automated Flagger Assistance Device (AFAD).
73. **Flasher**—a device used to turn highway traffic signal indications on and off at a repetitive rate of approximately once per second.
74. **Flashing**—an operation in which a light source, such as a traffic signal indication, is turned on and off repetitively.
75. **Flashing-Light Signals**—a warning device consisting of two red signal indications arranged horizontally that are activated to flash alternately when rail traffic is approaching or present at a grade crossing.
76. **Flashing Mode**—a mode of operation in which at least one traffic signal indication in each vehicular signal face of a highway traffic signal is turned on and off repetitively.

77. **Freeway**—a divided highway with full control of access. As per CVC 332, "Freeway" is a highway in respect to which the owners of abutting lands have no right or easement of access to or from their abutting lands or in respect to which such owners have only limited or restricted right or easement of access.
78. **Full-Actuated Operation**—a type of traffic control signal operation in which all signal phases function on the basis of actuation.
79. **Gate**—an automatically-operated or manually-operated traffic control device that is used to physically obstruct road users such that they are discouraged from proceeding past a particular point on a roadway or pathway, or such that they are discouraged from entering a particular grade crossing, ramp, lane, roadway, or facility.
80. **Grade Crossing**—the general area where a highway and a railroad and/or light rail transit route cross at the same level, within which are included the tracks, highway, and traffic control devices for traffic traversing that area.
81. **Guide Sign**—a sign that shows route designations, destinations, directions, distances, services, points of interest, or other geographical, recreational, or cultural information.
82. **High-Occupancy Vehicle (HOV)**—a motor vehicle carrying at least two or more persons, including carpools, vanpools, and buses.
83. **Highway**—a general term for denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way. As per CVC 360, "Highway" is a way or place of whatever nature, publicly maintained and open to the use of the public for purposes of vehicular travel. Highway includes street. Also, refer to CVC 590 definition of "Street".
84. **Highway-Light Rail Transit Grade Crossing**—the general area where a highway and a light rail transit route cross at the same level, within which are included the light rail transit tracks, highway, and traffic control devices for traffic traversing that area.
85. **Highway-Rail Grade Crossing**—the general area where a highway and a railroad cross at the same level, within which are included the railroad tracks, highway, and traffic control devices for highway traffic traversing that area.
86. **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, steadily-illuminated pavement markers, warning lights (see Section 6F.83), or steady burning electric lamps.
87. **HOV Lane**—any preferential lane designated for exclusive use by high-occupancy vehicles for all or part of a day—including a designated lane on a freeway, other highway, street, or independent roadway on a separate right-of-way.
88. **Hybrid Beacon**—a special type of beacon that is intentionally placed in a dark mode (no indications displayed) between periods of operation and, when operated, displays both steady and flashing traffic control signal indications.
89. **Inherently Low Emission Vehicle (ILEV)**—any kind of vehicle that, because of inherent properties of the fuel system design, will not have significant evaporative emissions, even if its evaporative emission control system has failed.
90. **In-Roadway Lights**—a special type of highway traffic signal installed in the roadway surface to warn road users that they are approaching a condition on or adjacent to the roadway that might not be readily apparent and might require the road users to slow down and/or come to a stop.
91. **Interchange**—a system of interconnecting roadways providing for traffic movement between two or more highways that do not intersect at grade.
92. **Interconnection**—when used in Part 8, the electrical connection between the railroad or light rail transit active warning system and the highway traffic signal controller assembly for the purpose of preemption.
93. **Intermediate Interchange**—an interchange with an urban or rural route that is not a major or minor interchange as defined in this Section.
94. **Intersection**—intersection is defined as follows:  
As per CVC 365, an "intersection" is the area embraced within the prolongation of the lateral curb lines, or, if none, then the lateral boundary lines of the roadways, of two highways which join one another at approximately right angles or the area within which vehicles traveling upon different highways joining at any other angle may come in conflict.

- (a) The area embraced within the prolongation or connection of the lateral curb lines, or if none, the lateral boundary lines of the roadways of two highways that join one another at, or approximately at, right angles, or the area within which vehicles traveling on different highways that join at any other angle might come into conflict.
  - (b) The junction of an alley or driveway with a roadway or highway shall not constitute an intersection, unless the roadway or highway at said junction is controlled by a traffic control device.
  - (c) If a highway includes two roadways that are 30 feet or more apart (see definition of Median), then every crossing of each roadway of such divided highway by an intersecting highway shall be a separate intersection.
  - (d) If both intersecting highways include two roadways that are 30 feet or more apart, then every crossing of any two roadways of such highways shall be a separate intersection.
  - (e) At a location controlled by a traffic control signal, regardless of the distance between the separate intersections as defined in (c) and (d) above:
    - (1) If a stop line, yield line, or crosswalk has not been designated on the roadway (within the median) between the separate intersections, the two intersections and the roadway (median) between them shall be considered as one intersection;
    - (2) Where a stop line, yield line, or crosswalk is designated on the roadway on the intersection approach, the area within the crosswalk and/or beyond the designated stop line or yield line shall be part of the intersection; and
    - (3) Where a crosswalk is designated on a roadway on the departure from the intersection, the intersection shall include the area extending to the far side of such crosswalk.
95. Intersection Control Beacon—a beacon used only at an intersection to control two or more directions of travel.
96. Interval—the part of a signal cycle during which signal indications do not change.
97. Interval Sequence—the order of appearance of signal indications during successive intervals of a signal cycle.
98. Island—a defined area between traffic lanes for control of vehicular movements, for toll collection, or for pedestrian refuge. It includes all end protection and approach treatments. Within an intersection area, a median or an outer separation is considered to be an island.
99. Lane Drop—see Dropped Lane.
100. Lane Line Markings—white pavement marking lines that delineate the separation of traffic lanes that have the same direction of travel on a roadway.
101. Lane-Use Control Signal—a signal face displaying indications to permit or prohibit the use of specific lanes of a roadway or to indicate the impending prohibition of such use.
102. Legend—see Sign Legend.
103. Lens—see Signal Lens.
104. Light Rail Transit Traffic (Light Rail Transit Equipment)—every device in, upon, or by which any person or property can be transported on light rail transit tracks, including single-unit light rail transit cars (such as streetcars and trolleys) and assemblies of multiple light rail transit cars coupled together.
- 104a. Limit Line - A "limit line" is a solid white line not less than 12 nor more than 24 inches wide, extending across a roadway or any portion thereof to indicate the point at which traffic is required to stop in compliance with legal requirements. Refer to CVC 377.
- 104b. Limit Line Detection Zone – a Referenced Bicycle-Rider must be detected in a 6 x 6 feet area immediately behind the limit line, centered either in a normal width lane or if the lane is more than 12 feet wide, centered 6 feet from the left lane line. For a lane of 20 feet or greater, two minimum 6 x 6 feet areas shall constitute the Limit Line Detection Zone.
105. Locomotive Horn—an air horn, steam whistle, or similar audible warning device (see 49 CFR Part 229.129) mounted on a locomotive or control cab car. The terms “locomotive horn,” “train whistle,” “locomotive whistle,” and “train horn” are used interchangeably in the railroad industry.
106. Logo—a distinctive emblem or trademark that identifies a commercial business and/or the product or service offered by the business.

- 107. **Longitudinal Markings**—pavement markings that are generally placed parallel and adjacent to the flow of traffic such as lane lines, center lines, edge lines, channelizing lines, and others.
- 108. **Louver**—see Signal Louver.
- 109. **Major Interchange**—an interchange with another freeway or expressway, or an interchange with a high-volume multi-lane highway, principal urban arterial, or major rural route where the interchanging traffic is heavy or includes many road users unfamiliar with the area.
- 110. **Major Street**—the street normally carrying the higher volume of vehicular traffic.
- 111. **Malfunction Management Unit**—same as Conflict Monitor.
- 112. **Managed Lane**—a highway lane or set of lanes, or a highway facility, for which variable operational strategies such as direction of travel, tolling, pricing, and/or vehicle type or occupancy requirements are implemented and managed in real-time in response to changing conditions. Managed lanes are typically buffer- or barrier-separated lanes parallel to the general-purpose lanes of a highway in which access is restricted to designated locations. There are also some highways on which all lanes are managed.
- 113. **Manual Lane**—see Attended Lane.
- 113a. **Markings – All lines, words, or symbols, except signs, officially placed within the roadway to regulate, warn or guide traffic.**
- 114. **Maximum Highway Traffic Signal Preemption Time**—the maximum amount of time needed following initiation of the preemption sequence for the highway traffic signals to complete the timing of the right-of-way transfer time, queue clearance time, and separation time.
- 115. **Median**—the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges, and at opposite approaches of the same intersection.
- 116. **Minimum Track Clearance Distance**—for standard two-quadrant warning devices, the minimum track clearance distance is the length along a highway at one or more railroad or light rail transit tracks, measured from the highway stop line, warning device, or 12 feet perpendicular to the track center line, to 6 feet beyond the track(s) measured perpendicular to the far rail, along the center line or edge line of the highway, as appropriate, to obtain the longer distance. For Four-Quadrant Gate systems, the minimum track clearance distance is the length along a highway at one or more railroad or light rail transit tracks, measured either from the highway stop line or entrance warning device, to the point where the rear of the vehicle would be clear of the exit gate arm. In cases where the exit gate arm is parallel to the track(s) and is not perpendicular to the highway, the distance is measured either along the center line or edge line of the highway, as appropriate, to obtain the longer distance.
- 117. **Minimum Warning Time**—when used in Part 8, the least amount of time active warning devices shall operate prior to the arrival of rail traffic at a grade crossing.
- 118. **Minor Interchange**—an interchange where traffic is local and very light, such as interchanges with land service access roads. Where the sum of the exit volumes is estimated to be lower than 100 vehicles per day in the design year, the interchange is classified as local.
- 119. **Minor Street**—the street normally carrying the lower volume of vehicular traffic.
- 120. **Movable Bridge Resistance Gate**—a type of traffic gate, which is located downstream of the movable bridge warning gate, that provides a physical deterrent to vehicle and/or pedestrian traffic when placed in the appropriate position.
- 121. **Movable Bridge Signal**—a highway traffic signal installed at a movable bridge to notify traffic to stop during periods when the roadway is closed to allow the bridge to open.
- 122. **Movable Bridge Warning Gate**—a type of traffic gate designed to warn, but not primarily to block, vehicle and/or pedestrian traffic when placed in the appropriate position.
- 123. **Multi-Lane**—more than one lane moving in the same direction. A multi-lane street, highway, or roadway has a basic cross-section comprised of two or more through lanes in one or both directions. A multi-lane approach has two or more lanes moving toward the intersection, including turning lanes.
- 124. **Neutral Area**—the paved area between the channelizing lines separating an entrance or exit ramp or a channelized turn lane or channelized entering lane from the adjacent through lane(s).
- 124a. **Night or Night or Nighttime – Refer to CVC 280, definition of darkness.**

- 124b. Nonmotorized Traffic – Bicycle and pedestrian component of traffic.**
- 125. Object Marker**—a device used to mark obstructions within or adjacent to the roadway.
- 126. Occupancy Requirement**—any restriction that regulates the use of a facility or one or more lanes of a facility for any period of the day based on a specified number of persons in a vehicle.
- 127. Occupant**—a person driving or riding in a car, truck, bus, or other vehicle.
- 128. Open-Road ETC Lane**—a non-attended lane that is designed to allow toll payments to be electronically collected from vehicles traveling at normal highway speeds. Open-Road ETC lanes are typically physically separated from the toll plaza, often following the alignment of the mainline lanes, with toll plaza lanes for cash toll payments being on a different alignment after diverging from the mainline lanes or a subset thereof.
- 129. Open-Road Tolling**—a system designed to allow electronic toll collection (ETC) from vehicles traveling at normal highway speeds. Open-Road Tolling might be used on toll roads or toll facilities in conjunction with toll plazas. Open-Road Tolling is also typically used on managed lanes and on toll facilities that only accept payment by ETC.
- 130. Open-Road Tolling Point**—the location along an Open-Road ETC lane at which roadside or overhead detection and receiving equipment are placed and vehicles are electronically assessed a toll.
- 131. Opposing Traffic**—vehicles that are traveling in the opposite direction. At an intersection, vehicles entering from an approach that is approximately straight ahead would be considered to be opposing traffic, but vehicles entering from approaches on the left or right would not be considered to be opposing traffic.
- 132. Overhead Sign**—a sign that is placed such that a portion or the entirety of the sign or its support is directly above the roadway or shoulder such that vehicles travel below it. Typical installations include signs placed on cantilever arms that extend over the roadway or shoulder, on sign support structures that span the entire width of the pavement, on mast arms or span wires that also support traffic control signals, and on highway bridges that cross over the roadway.
- 133. Parking Area**—a parking lot or parking garage that is separated from a roadway. Parallel or angle parking spaces along a roadway are not considered a parking area.
- 134. Passive Grade Crossing**—a grade crossing where none of the automatic traffic control devices associated with an Active Grade Crossing Warning System are present and at which the traffic control devices consist entirely of signs and/or markings.
- 135. Pathway**—a general term denoting a public way for purposes of travel by authorized users outside the traveled way and physically separated from the roadway by an open space or barrier and either within the highway right-of-way or within an independent alignment. Pathways include shared-use paths, but do not include sidewalks.
- 136. Pathway Grade Crossing**—the general area where a pathway and railroad or light rail transit tracks cross at the same level, within which are included the tracks, pathway, and traffic control devices for pathway traffic traversing that area.
- 137. Paved**—a bituminous surface treatment, mixed bituminous concrete, or Portland cement concrete roadway surface that has both a structural (weight bearing) and a sealing purpose for the roadway.
- 138. Pedestrian**—a person on foot, in a wheelchair, on skates, or on a skateboard. **As per CVC 467, (a) A "pedestrian" is a person who is afoot or who is using any of the following: (1) A means of conveyance propelled by human power other than a bicycle. (2) An electric personal assistive mobility device. (b) "Pedestrian" includes a person who is operating a self-propelled wheelchair, motorized tricycle, or motorized quadricycle and, by reason of physical disability, is otherwise unable to move about as a pedestrian, as specified in subdivision(a).**
- 139. Pedestrian Change Interval**—an interval during which the flashing UPRAISED HAND (symbolizing DONT WALK) signal indication is displayed.
- 140. Pedestrian Clearance Time**—the time provided for a pedestrian crossing in a crosswalk, after leaving the curb or shoulder, to travel to the far side of the traveled way or to a median.
- 141. Pedestrian Facilities**—a general term denoting improvements and provisions made to accommodate or encourage walking.
- 142. Pedestrian Hybrid Beacon**— a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.

143. **Pedestrian Signal Head**—a signal head, which contains the symbols **WALKING PERSON** (symbolizing **WALK**) and **UPRAISED HAND** (symbolizing **DONT WALK**), that is installed to direct pedestrian traffic at a traffic control signal.
144. **Permissive Mode**—a mode of traffic control signal operation in which left or right turns are permitted to be made after yielding to pedestrians, if any, and/or opposing traffic, if any. When a **CIRCULAR GREEN** signal indication is displayed, both left and right turns are permitted unless otherwise prohibited by another traffic control device. When a flashing **YELLOW ARROW** or flashing **RED ARROW** signal indication is displayed, the turn indicated by the arrow is permitted.
145. **Physical Gore**—a longitudinal point where a physical barrier or the lack of a paved surface inhibits road users from crossing from a ramp or channelized turn lane or channelized entering lane to the adjacent through lane(s) or vice versa.
146. **Pictograph**—a pictorial representation used to identify a governmental jurisdiction, an area of jurisdiction, a governmental agency, a military base or branch of service, a governmental-approved university or college, a toll payment system, or a government-approved institution.
147. **Plaque**—a traffic control device intended to communicate specific information to road users through a word, symbol, or arrow legend that is placed immediately adjacent to a sign to supplement the message on the sign. The difference between a plaque and a sign is that a plaque cannot be used alone. The designation for a plaque includes a “P” suffix.
148. **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.
149. **Portable Traffic Control Signal**—a temporary traffic control signal that is designed so that it can be easily transported and reused at different locations.
150. **Post-Mounted Sign**—a sign that is placed to the side of the roadway such that no portion of the sign or its support is directly above the roadway or shoulder.
151. **Posted Speed Limit**—a speed limit determined by law or regulation and displayed on Speed Limit signs.
152. **Preemption**—the transfer of normal operation of a traffic control signal to a special control mode of operation.
153. **Preferential Lane**—a highway lane reserved for the exclusive use of one or more specific types of vehicles or vehicles with at least a specific number of occupants.
154. **Pre-Signal**—traffic control signal faces that control traffic approaching a grade crossing in conjunction with the traffic control signal faces that control traffic approaching a highway-highway intersection beyond the tracks. Supplemental near-side traffic control signal faces for the highway-highway intersection are not considered pre-signals. Pre-signals are typically used where the clear storage distance is insufficient to store one or more design vehicles.
155. **Pretimed Operation**—a type of traffic control signal operation in which none of the signal phases function on the basis of actuation.
156. **Primary Signal Face**—one of the required or recommended minimum number of signal faces for a given approach or separate turning movement, but not including near-side signal faces required as a result of the far-side signal faces exceeding the maximum distance from the stop line.
157. **Principal Legend**—place names, street names, and route numbers placed on guide signs.
158. **Priority Control**—a means by which the assignment of right-of-way is obtained or modified.
159. **Private Road Open to Public Travel**—private toll roads and roads (including any adjacent sidewalks that generally run parallel to the road) within shopping centers, airports, sports arenas, and other similar business and/or recreation facilities that are privately owned, but where the public is allowed to travel without access restrictions. Roads within private gated properties (except for gated toll roads) where access is restricted at all times, parking areas, driving aisles within parking areas, and private grade crossings shall not be included in this definition.
- 159a. **Private Road or Driveway** - "Private road or driveway" is a way or place in private ownership and used for vehicular travel by the owner and those having express or implied permission from the owner but not by other members of the public. Refer to CVC 490.
- 159b. **Professional Engineer** - a person engaged in the professional practice of rendering service or creative work requiring education, training and experience in engineering sciences and the application of special knowledge

of the mathematical, physical and engineering sciences in such professional or creative work as consultation, investigation, evaluation, planning or design of public or private utilities, structures, machines, processes, circuits, buildings, equipment or projects, and supervision of construction for the purpose of securing compliance with specifications and design for any such work. Refer to California Business and Professions Code Section 6701.

160. **Protected Mode**—a mode of traffic control signal operation in which left or right turns are permitted to be made when a left or right GREEN ARROW signal indication is displayed.
161. **Public Road**—any road, street, or similar facility under the jurisdiction of and maintained by a public agency and open to public travel.
162. **Pushbutton**—a button to activate a device or signal timing for pedestrians, bicyclists, or other road users.
163. **Pushbutton Information Message**—a recorded message that can be actuated by pressing a pushbutton when the walk interval is not timing and that provides the name of the street that the crosswalk associated with that particular pushbutton crosses and can also provide other information about the intersection signalization or geometry.
164. **Pushbutton Locator Tone**—a repeating sound that informs approaching pedestrians that a pushbutton exists to actuate pedestrian timing or receive additional information and that enables pedestrians who have visual disabilities to locate the pushbutton.
165. **Queue Clearance Time**—when used in Part 8, the time required for the design vehicle of maximum length stopped just inside the minimum track clearance distance to start up and move through and clear the entire minimum track clearance distance. If pre-signals are present, this time shall be long enough to allow the vehicle to move through the intersection, or to clear the tracks if there is sufficient clear storage distance. If a Four-Quadrant Gate system is present, this time shall be long enough to permit the exit gate arm to lower after the design vehicle is clear of the minimum track clearance distance.
166. **Quiet Zone**—a segment of a rail line, with one or a number of consecutive public highway-rail grade crossings at which locomotive horns are not routinely sounded per 49 CFR Part 222.
167. **Rail Traffic**—every device in, upon, or by which any person or property can be transported on rails or tracks and to which all other traffic must yield the right-of-way by law at grade crossings, including trains, one or more locomotives coupled (with or without cars), other railroad equipment, and light rail transit operating in exclusive or semi-exclusive alignments. Light rail transit operating in a mixed-use alignment, to which other traffic is not required to yield the right-of-way by law, is a vehicle and is not considered to be rail traffic.
168. **Raised Pavement Marker**—a device mounted on or in a road surface that has a height generally not exceeding approximately 1 inch above the road surface for a permanent marker, or not exceeding approximately 2 inches above the road surface for a temporary flexible marker, and that is intended to be used as a positioning guide and/or to supplement or substitute for pavement markings.
169. **Ramp Control Signal**—a highway traffic signal installed to control the flow of traffic onto a freeway at an entrance ramp or at a freeway-to-freeway ramp connection.
170. **Ramp Meter**—see Ramp Control Signal.
171. **Red Clearance Interval**—an interval that follows a yellow change interval and precedes the next conflicting green interval.
- 171a. **Reference Bicycle-Rider** – a minimum 4 feet tall person, weighing minimum 90 lb, riding on an unmodified minimum 16 inch wheel bicycle with non-ferromagnetic frame, non-ferromagnetic fork and cranks, aluminum rims, stainless steel spokes, and headlight.
- 171b. **Registered Engineer** – See Professional Engineer. Refer to California Business and Professions Code Section 6704.
172. **Regulatory Sign**—a sign that gives notice to road users of traffic laws or regulations.
173. **Retroreflectivity**—a property of a surface that allows a large portion of the light coming from a point source to be returned directly back to a point near its origin.
174. **Right-of-Way [Assignment]**—the permitting of vehicles and/or pedestrians to proceed in a lawful manner in preference to other vehicles or pedestrians by the display of a sign or signal indications.

175. **Right-of-Way Transfer Time**—when used in Part 8, the maximum amount of time needed for the worst case condition, prior to display of the track clearance green interval. This includes any railroad or light rail transit or highway traffic signal control equipment time to react to a preemption call, and any traffic control signal green, pedestrian walk and clearance, yellow change, and red clearance intervals for conflicting traffic.
176. **Road**—see Roadway.
177. **Road User**—a vehicle operator, bicyclist, or pedestrian, including persons with disabilities, within the highway or on a private road open to public travel.
178. **Roadway**—that portion of a highway improved, designed, or ordinarily used for vehicular travel and parking lanes, but exclusive of the sidewalk, berm, or shoulder even though such sidewalk, berm, or shoulder is used by persons riding bicycles or other human-powered vehicles. In the event a highway includes two or more separate roadways, the term roadway as used in this Manual shall refer to any such roadway separately, but not to all such roadways collectively. Refer to CVC 527.
179. **Roadway Network**—a geographical arrangement of intersecting roadways.
180. **Roundabout**—a circular intersection with yield control at entry, which permits a vehicle on the circulatory roadway to proceed, and with deflection of the approaching vehicle counter-clockwise around a central island.
181. **Rumble Strip**—a series of intermittent, narrow, transverse areas of rough-textured, slightly raised, or depressed road surface that extend across the travel lane to alert road users to unusual traffic conditions or are located along the shoulder, along the roadway center line, or within islands formed by pavement markings to alert road users that they are leaving the travel lanes.
182. **Rural Highway**—a type of roadway normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians.
183. **Safe-Positioned**—the positioning of emergency vehicles at an incident in a manner that attempts to protect both the responders performing their duties and road users traveling through the incident scene, while minimizing, to the extent practical, disruption of the adjacent traffic flow.
- 183a. **Scenic Highway** – An officially designated portion of the State Highway System traversing areas of outstanding scenic beauty which together with the adjacent scenic corridors requires special scenic conservation treatment.
184. **School**—a public or private educational institution recognized by the state education authority for one or more grades K through 12 or as otherwise defined by the State.
185. **School Zone**—a designated roadway segment approaching, adjacent to, and beyond school buildings or grounds, or along which school related activities occur. As per CVC 22352(a)(2)(B) When approaching or passing a school building or the grounds thereof, contiguous to a highway and posted with a standard "SCHOOL" warning sign, while children are going to or leaving the school either during school hours or during the noon recess period. The prima facie limit shall also apply when approaching or passing any school grounds which are not separated from the highway by a fence, gate, or other physical barrier while the grounds are in use by children and the highway is posted with a standard "SCHOOL" warning sign.
186. **Semi-Actuated Operation**—a type of traffic control signal operation in which at least one, but not all, signal phases function on the basis of actuation.
187. **Separate Turn Signal Face**—a signal face that exclusively controls a turn movement and that displays signal indications that are applicable only to the turn movement.
188. **Separation Time**—the component of maximum highway traffic signal preemption time during which the minimum track clearance distance is clear of vehicular traffic prior to the arrival of rail traffic.
189. **Shared Roadway**—a roadway that is officially designated and marked as a bicycle route, but which is open to motor vehicle travel and upon which no bicycle lane is designated. Shared Roadway (No Bikeway Designation) – A roadway that permits bicycle use but is not officially designated as a bikeway.
190. **Shared Turn Signal Face**—a signal face, for controlling both a turn movement and the adjacent through movement, that always displays the same color of circular signal indication that the adjacent through signal face or faces display.
191. **Shared-Use Path (Class I Bikeway)** —a bikeway outside the traveled way and physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-

way or within an independent alignment. Shared-use paths are also used by pedestrians (including skaters, users of manual and motorized wheelchairs, and joggers) and other authorized motorized and non-motorized users. Refer to the Department's Highway Design Manual Index 1003.1 for design criteria.

- 191a. **Shoulder** – The portion of the highway contiguous with the roadway for accommodations of pedestrians, bicyclists, stopped vehicles, for emergency use, and for lateral support of base and surface courses.
192. **Sidewalk**—that portion of a street between the curb line, or the lateral line of a roadway, and the adjacent property line or on easements of private property that is paved or improved and intended for use by pedestrians. As per CVC 555, "Sidewalk" is that portion of a highway, other than the roadway, set apart by curbs, barriers, markings or other delineation for pedestrian travel.
193. **Sign**—any traffic control device that is intended to communicate specific information to road users through a word, symbol, and/or arrow legend. Signs do not include highway traffic signals, pavement markings, delineators, or channelization devices.
194. **Sign Assembly**—a group of signs, located on the same support(s), that supplement one another in conveying information to road users.
195. **Sign Illumination**—either internal or external lighting that shows similar color by day or night. Street or highway lighting shall not be considered as meeting this definition.
196. **Sign Legend**—all word messages, logos, pictographs, and symbol and arrow designs that are intended to convey specific meanings. The border, if any, on a sign is not considered to be a part of the legend.
197. **Sign Panel**—a separate panel or piece of material containing a word, symbol, and/or arrow legend that is affixed to the face of a sign.
198. **Signal Backplate**—a thin strip of material that extends outward from and parallel to a signal face on all sides of a signal housing to provide a background for improved visibility of the signal indications.
199. **Signal Coordination**—the establishment of timed relationships between adjacent traffic control signals.
200. **Signal Face**—an assembly of one or more signal sections that is provided for controlling one or more traffic movements on a single approach.
201. **Signal Head**—an assembly of one or more signal faces that is provided for controlling traffic movements on one or more approaches.
202. **Signal Housing**—that part of a signal section that protects the light source and other required components.
203. **Signal Indication**—the illumination of a signal lens or equivalent device.
204. **Signal Lens**—that part of the signal section that redirects the light coming directly from the light source and its reflector, if any.
205. **Signal Louver**—a device that can be mounted inside a signal visor to restrict visibility of a signal indication from the side or to limit the visibility of the signal indication to a certain lane or lanes, or to a certain distance from the stop line.
206. **Signal Phase**—the right-of-way, yellow change, and red clearance intervals in a cycle that are assigned to an independent traffic movement or combination of movements.
207. **Signal Section**—the assembly of a signal housing, signal lens, if any, and light source with necessary components to be used for displaying one signal indication.
208. **Signal System**—two or more traffic control signals operating in signal coordination.
209. **Signal Timing**—the amount of time allocated for the display of a signal indication.
210. **Signal Visor**—that part of a signal section that directs the signal indication specifically to approaching traffic and reduces the effect of direct external light entering the signal lens.
211. **Signing**—individual signs or a group of signs, not necessarily on the same support(s), that supplement one another in conveying information to road users.
212. **Simultaneous Preemption**—notification of approaching rail traffic is forwarded to the highway traffic signal controller unit or assembly and railroad or light rail transit active warning devices at the same time.
213. **Special Purpose Road**—a low-volume, low-speed road that serves recreational areas or resource development activities.

- 214. Speed**—speed is defined based on the following classifications:
- (a) **Average Speed**—the summation of the instantaneous or spot-measured speeds at a specific location of vehicles divided by the number of vehicles observed.
  - (b) **Design Speed**—a selected speed used to determine the various geometric design features of a roadway.
  - (c) **85th-Percentile Speed**—the speed at or below which 85 percent of the motor vehicles travel.
  - (d) **Operating Speed**—a speed at which a typical vehicle or the overall traffic operates. Operating speed might be defined with speed values such as the average, pace, or 85th-percentile speeds.
  - (e) **Pace**—the 10 mph speed range representing the speeds of the largest percentage of vehicles in the traffic stream.
- 215. Speed Limit**—the maximum (or minimum) speed applicable to a section of highway as established by law or regulation.
- 216. Speed Limit Sign Beacon**—a beacon used to supplement a SPEED LIMIT sign.
- 217. Speed Measurement Markings**—a white transverse pavement marking placed on the roadway to assist the enforcement of speed regulations.
- 218. Speed Zone**—a section of highway with a speed limit that is established by law or regulation, but which might be different from a legislatively specified statutory speed limit.
- 219. Splitter Island**—a median island used to separate opposing directions of traffic entering and exiting a roundabout.
- 219a. State Highway** – Any highway owned and operated by the Department of Transportation.
- 220. Station Crossing**—a pathway grade crossing that is associated with a station platform.
- 221. Statutory Speed Limit**—a speed limit established by legislative action that typically is applicable for a particular class of highways with specified design, functional, jurisdictional and/or location characteristics and that is not necessarily displayed on Speed Limit signs.
- 222. Steady (Steady Mode)**—the continuous display of a signal indication for the duration of an interval, signal phase, or consecutive signal phases.
- 223. Stop Beacon**—a beacon used to supplement a STOP sign, a DO NOT ENTER sign, or a WRONG WAY sign.
- 224. 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. **For all purposes, limit line(s) as defined per CVC 377 shall mean stop line(s).**
- 225. Street**—see Highway. **As per CVC 590, "Street" is a way or place of whatever nature, publicly maintained and open to the use of the public for purposes of vehicular travel.**
- 226. Supplemental Signal Face**—a signal face that is not a primary signal face but which is provided for a given approach or separate turning movement to enhance visibility or conspicuity.
- 227. Symbol**—the approved design of a pictorial representation of a specific traffic control message for signs, pavement markings, traffic control signals, or other traffic control devices, as shown in the MUTCD.
- 228. Temporary Traffic Control Signal**—a traffic control signal that is installed for a limited time period.
- 229. Temporary Traffic Control Zone**—an area of a highway where road user conditions are changed because of a work zone or incident by the use of temporary traffic control devices, flaggers, uniformed law enforcement officers, or other authorized personnel.
- 230. Theoretical Gore**—a longitudinal point at the upstream end of a neutral area at an exit ramp or channelized turn lane where the channelizing lines that separate the ramp or channelized turn lane from the adjacent through lane(s) begin to diverge, or a longitudinal point at the downstream end of a neutral area at an entrance ramp or channelized entering lane where the channelizing lines that separate the ramp or channelized entering lane from the adjacent through lane(s) intersect each other.
- 231. Timed Exit Gate Operating Mode**—a mode of operation where the exit gate descent at a grade crossing is based on a predetermined time interval.
- 232. Toll Booth**—a shelter where a toll attendant is stationed to collect tolls or issue toll tickets. A toll booth is located adjacent to a toll lane and is typically set on a toll island.

233. **Toll Island**—a raised island on which a toll booth or other toll collection and related equipment are located.
234. **Toll Lane**—an individual lane located within a toll plaza in which a toll payment is collected or, for toll-ticket systems, a toll ticket is issued.
235. **Toll Plaza**—the location at which tolls are collected consisting of a grouping of toll booths, toll islands, toll lanes, and, typically, a canopy. Toll plazas might be located on highway mainlines or on interchange ramps. A mainline toll plaza is sometimes referred to as a barrier toll plaza because it interrupts the traffic flow.
236. **Toll-Ticket System**—a system in which the user of a toll road receives a ticket from a machine or toll booth attendant upon entering a toll system. The ticket denotes the user's point of entry and, upon exiting the toll system, the user surrenders the ticket and is charged a toll based on the distance traveled between the points of entry and exit.
237. **Traffic**—pedestrians, bicyclists, ridden or herded animals, vehicles, streetcars, and other conveyances either singularly or together while using for purposes of travel any highway or private road open to public travel. **As per CVC 620, the term "traffic" includes pedestrians, ridden animals, vehicles, street cars, and other conveyances, either singly or together, while using any highway for purposes of travel.**
238. **Traffic Control Device**—a sign, signal, marking, or other device used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, private road open to public travel, pedestrian facility, or shared-use path by authority of a public agency or official having jurisdiction, or, in the case of a private road open to public travel, by authority of the private owner or private official having jurisdiction.
239. **Traffic Control Signal (Traffic Signal)**—any highway traffic signal by which traffic is alternately directed to stop and permitted to proceed.
240. **Train**—one or more locomotives coupled, with or without cars, that operates on rails or tracks and to which all other traffic must yield the right-of-way by law at highway-rail grade crossings.
241. **Transverse Markings**—pavement markings that are generally placed perpendicular and across the flow of traffic such as shoulder markings; word, symbol, and arrow markings; stop lines; crosswalk lines; speed measurement markings; parking space markings; and others.
242. **Traveled Way**—the portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.
243. **Turn Bay**—a lane for the exclusive use of turning vehicles that is formed on the approach to the location where the turn is to be made. In most cases where turn bays are provided, drivers who desire to turn must move out of a through lane into the newly formed turn bay in order to turn. A through lane that becomes a turn lane is considered to be a dropped lane rather than a turn bay.
244. **Upstream**—a term that refers to a location that is encountered by traffic prior to a downstream location as it flows in an “upstream to downstream” direction. For example, “the upstream end of a lane line separating the turn lane from a through lane on the approach to an intersection” is the end of the line that is furthest from the intersection.
245. **Urban Street**—a type of street normally characterized by relatively low speeds, wide ranges of traffic volumes, narrower lanes, frequent intersections and driveways, significant pedestrian traffic, and more businesses and houses.
246. **Vehicle**—every device in, upon, or by which any person or property can be transported or drawn upon a highway, except trains and light rail transit operating in exclusive or semi-exclusive alignments. Light rail transit equipment operating in a mixed-use alignment, to which other traffic is not required to yield the right-of-way by law, is a vehicle. **As per CVC 670, a "vehicle" is a device by which any person or property may be propelled, moved, or drawn upon a highway, excepting a device moved exclusively by human power or used exclusively upon stationary rails or tracks.**
247. **Vibrotactile Pedestrian Device**—an accessible pedestrian signal feature that communicates, by touch, information about pedestrian timing using a vibrating surface.
248. **Visibility-Limited Signal Face or Visibility-Limited Signal Section**—a type of signal face or signal section designed (or shielded, hooded, or louvered) to restrict the visibility of a signal indication from the side, to a certain lane or lanes, or to a certain distance from the stop line.

- 249. Walk Interval**—an interval during which the WALKING PERSON (symbolizing WALK) signal indication is displayed.
- 250. Warning Beacon**—a beacon used only to supplement an appropriate warning or regulatory sign or marker.
- 251. Warning Light**—a portable, powered, yellow, lens-directed, enclosed light that is used in a temporary traffic control zone in either a steady burn or a flashing mode.
- 252. Warning Sign**—a sign that gives notice to road users of a situation that might not be readily apparent.
- 253. Warrant**—a warrant describes a threshold condition based upon average or normal conditions that, if found to be satisfied as part of an engineering study, shall result in analysis of other traffic conditions or factors to determine whether a traffic control device or other improvement is justified. 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.
- 254. Wayside Equipment**—the signals, switches, and/or control devices for railroad or light rail transit operations housed within one or more enclosures located along the railroad or light rail transit right-of-way and/or on railroad or light rail transit property.
- 255. Wayside Horn System**—a stationary horn (or series of horns) located at a grade crossing that is used in conjunction with train-activated or light rail transit-activated warning systems to provide audible warning of approaching rail traffic to road users on the highway or pathway approaches to a grade crossing, either as a supplement or alternative to the sounding of a locomotive horn.
- 256. Worker**—a person on foot whose duties place him or her within the right-of-way of a street, highway, or pathway, such as street, highway, or pathway construction and maintenance forces, survey crews, utility crews, responders to incidents within the street, highway, or pathway right-of-way, and law enforcement personnel when directing traffic, investigating crashes, and handling lane closures, obstructed roadways, and disasters within the right-of-way of a street, highway, or pathway.
- 257. Wrong-Way Arrow**—a slender, elongated, white pavement marking arrow placed upstream from the ramp terminus to indicate the correct direction of traffic flow. Wrong-way arrows are intended primarily to warn wrong-way road users that they are going in the wrong direction.
- 258. Yellow Change Interval**—the first interval following the green or flashing arrow interval during which the steady yellow signal indication is displayed.
- 259. Yield Line**—a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is intended or required to be made.

Support:

<sup>04</sup> The following terms are defined in the California Vehicle Code:

- 1. Alley - Section 110.
- 2. Amber - Section 112.
- 3. Authorized Emergency Vehicle - Section 165.
- 4. Automated Enforcement System - Section 210.
- 5. Axle - Section 230.
- 6. Bicycle - Section 231.
- 7. Bicycle Path - Section 231.5
- 8. Bicycle Path Crossing – Section 231.6
- 9. Bus - Section 233.
- 10. Business District - Section 235.
- 11. Business and Residence Districts: Determination – Section 240
- 12. Clean Fuel Vehicle - Section 257.
- 13. Commercial Vehicle - Section 260.
- 14. Crosswalk - Section 275.
- 15. Darkness – Section 280
- 16. Department of Transportation - Section 291.
- 17. Disabled Person - Section 295.5.
- 18. Engineering and Traffic Survey - Section 627.

19. Expressway – Section 314.
20. Freeway - Section 332.
21. Golf Cart - Section 345.
22. Hazardous Material - Section 353.
23. Highway - Section 360.
24. Intersection - Section 365.
25. Limit Line - Section 377.
26. Liquefied Petroleum Gas – Section 380.
27. Local Authorities - Section 385.
28. Low Speed Vehicle – Section 385.5.
29. Motorcycle - Section 400.
30. Motor-Driven Cycle – Section 405.
31. Motorized Bicycle – Section 406.
32. Motorized Quadricycle and Motorized Tricycle – Section 407.
33. Motorized Scooter – Section 407.5.
34. Motor Vehicle - Section 415.
35. Official Traffic Control Device - Section 440.
36. Official Traffic Control Signal - Section 445.
37. Park or Parking - Section 463.
38. Pedestrian - Section 467.
39. Pickup Truck - Section 471.
40. Pilot Car – Section 472.
41. Pocket Bike – Section 473.
42. Private Road or Driveway - Section 490.
43. Private School - Section 492.
44. Residence District – Section 515.
45. Ridesharing – Section 522.
46. Right-of-way – Section 525.
47. Road - Section 527.
48. Roadway - Section 530.
49. Safety Zone – Section 540.
50. Schoolbus - Section 545.
51. Sidewalk - Section 555.
52. Snowmobile - Section 557.
53. Stop or Stopping - Section 587.
54. Street - Section 590.
55. Street or Highway - Section 591.
56. Street or Highway – Highway Exclusion - Section 592.
57. Through Highway - Section 600.
58. Toll Highway or Toll Road – Section 611.
59. Traffic - Section 620.
60. Trailer - Section 630.
61. U-Turn - Section 665.5.
62. Vehicle - Section 670.

## **Section 1A.14 Meanings of Acronyms and Abbreviations in this Manual**

### **Standard:**

01 **The following acronyms and abbreviations, when used in this Manual, shall have the following meanings:**

- 1. AADT—annual average daily traffic**
- 2. AASHTO—American Association of State Highway and Transportation Officials**
- 3. ADA—Americans with Disabilities Act**
- 4. ADAAG—Americans with Disabilities Accessibility Guidelines**

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

Support:

<sup>02</sup> The following list of acronyms are related to traffic control devices and provided for ease of use and as a handy reference:

1. AADT Average Annual Daily Traffic
2. AASHTO American Association of State Highway and Transportation Officials
3. ADA Americans with Disabilities Act
4. ADT Average Daily Traffic
5. AHS Automated Highway System
6. Alt Alternate
7. AMBER Use of CMS signs for child abduction alert messages
8. AMIS Automated Management Information System
9. ANSI American National Standards Institute
10. APWA American Public Works Association
11. ASCE American Society of Civil Engineers

12. ASTM	American Society for Testing and Materials
13. ATIS	Advanced Traveler Information Systems
14. ATMS	Advanced Traffic Management System
15. ATSSA	American Traffic Safety Services Association
16. AVCS	Automated Vehicle Control System
17. BART	Bay Area Rapid Transit
18. BT&H	Business, Transportation & Housing Agency
19. CA	California
20. CAC	California Administrative Code
21. Cal/OSHA	California Occupational Safety and Health Administration
22. CA MUTCD	California Manual on Uniform Traffic Control Devices for Streets and Highways
23. Caltrans	California Department of Transportation
24. CBD	Central Business District
25. CCMP	County Congestion Management Plan
26. CCO	Contract Change Order
27. CCR	California Code of Regulations
28. CDC	California Department of Conservation
29. CDF	California Department of Forestry
30. CDFG	California Department of Fish and Game
31. CEAC	County Engineers Association of California
32. CELSOC	Consulting Engineering and Land Surveyors of California
33. CFR	Code of Federal Regulations
34. CHIN	California Highway Information Network
35. CHP	California Highway Patrol
36. CMA	Congestion Management Agency
37. CMP	Congestion Management Program
38. CMS	Changeable Message Sign or Congestion Management System
39. COB	Close of Business
40. COZEPP	Construction Zone Enhanced Enforcement Program
41. CPC	California Penal Code
42. CPH	California Permit Handbook
43. CPM	Critical Path Method
44. CPUC	California Public Utilities Commission
45. CRHR	California Register of Historical Resources
46. CT	Caltrans or California Department of Transportation
47. CTA	California Trucking Association
48. CTC	California Transportation Commission
49. CTCDC	California Traffic Control Devices Committee
50. CTP	California Transportation Plan
51. CURE	Clean-up Roadside Environment
52. CVC	California Vehicle Code
53. Del	Delineator
54. DHV	Design Hourly Volume
55. DI	Delay Index, Drop Inlet or Drainage Inlet
56. DIB	Design Information Bulletin
57. DMV	Department of Motor Vehicles
58. DOT	Department of Transportation
59. DTO	Division of Traffic Operations
60. DYS	Double Yellow Stripe
61. ENGR	Engineer or Engineering
62. EP	Edge of Pavement or Environmental Planning
63. ES	Edge of Shoulder or End Section
64. ESA	Environmentally Sensitive Area or Endangered Species Act

65. ESAL	Equivalent Single-Axle Loads
66. ETW	Edge of Traveled Way
67. Exp or EXP	Expressway
68. F&E System	Freeway and Expressway System
69. FAI	Federal-aid Interstate
70. FAP	Federal-aid Primary
71. FCC	Federal Communication Commission
72. FEBT	Facing Eastbound Traffic
73. FHWA	Federal Highway Administration
74. FNBT	Facing Northbound Traffic
75. FR	Federal Register
76. Fr Rd	Frontage Road
77. FS	Far Side
78. FSBT	Facing Southbound Traffic
79. FSP	Freeway Service Patrol
80. FWBT	Facing Westbound Traffic
81. Fwy or FWY	Freeway
82. GR	Guard Railing
83. HAR	Highway Advisory Radio
84. HAZMAT	Hazardous Material
85. HCM	Highway Capacity Manual
86. HDM	Highway Design Manual
87. HOT	High Occupancy Toll
88. HOV	High-Occupancy Vehicle
89. HOVL	High-Occupancy Vehicle Lane
90. HM	Hazardous Material
91. HQ	Caltrans Headquarters
92. HW	Hazardous Waste
93. Hwy or HWY	Highway
94. IGR	Intergovernmental Review
95. ILEV	Inherently Low Emission Vehicle
96. IRLs	In-Roadway Lights
97. IRWLs	In-Roadway Warning Lights
98. ISO	International Standards Organization
99. ISTEA	Intermodal Surface Transportation Efficiency Act of 1991 (Federal)
100. ITE	Institute of Transportation Engineers
101. ITS	Intelligent Transportation Systems or Institute of Transportation Studies
102. ITTE	Institute of Transportation & Traffic Engineering
103. IVHS	Intelligent Vehicle Highway System
104. KP	Kilometer Post
105. LED	Light Emitting Diode
106. LF	Linear Foot
107. Ln or LN	Lane
108. Loc or LOC	Location
109. LOS	Level of service (Traffic Congestion Measure)
110. LPA	Local Public Agency
111. LRT	Light Rail Transit
112. MADT	Monthly Average Daily Traffic
113. Maint	Maintenance
114. Max or MAX	Maximum
115. MAZEPP	Maintenance Zone Enhanced Enforcement Program
116. MBGR	Metal Beam Guard Rail
117. Med or MED	Median

118.MF	Mixed Flow
119.mi or MI	Mile or Miles
120.Min or MIN	Minimum
121.Misc or MISC	Miscellaneous
122.mm	Millimeter
123.mph or MPH	Miles per Hour
124.MPO	Metropolitan Planning Organization
125.MT	Mass Transit
126.MTC	Metropolitan Transportation Commission (for the San Francisco Bay Area)
127.MUTCD	Manual on Uniform Traffic Control Devices
128.MVM	Per Million Vehicle Miles
129.NCEES	National Council of Examiners for Engineering and Surveying
130.NCHRP	National Cooperative Highway Research Program
131.NCRP	National Cooperative Research Program
132.NCUT	National Committee on Urban Transportation
133.NCUTCD	National Committee on Uniform Traffic Control Devices
134.NCUTLO	National Committee on Uniform Traffic Laws and Ordinances
135.NHI	National Highway Institute
136.NHL	National Historic Landmark
137.NHS	National Highway System
138.NHSB	National Highway Safety Bureau
139.NHTSA	National Highway Traffic Safety Administration
140.NNIH	National Network of Interstage Highways
141.NPRM	Notice of Proposed Rule Making
142.NPS	National Park Service (U.S.)
143.NR	National Register (of Historic Places, abbreviation)
144.NRHP	National Register of Historic Places
145.NS	Near Side
146.NTS	National Transportation System or Not To Scale
147.NTSB	National Transportation Safety Board
148.O & D	Origin and Destination
149.OCTA	Orange County Transportation Authority
150.ODA	Outdoor Advertising (Act)
151.OES	Office of Emergency Services
152.OG	Original Ground
153.OH	Overhead (Structure)
154.OHP	Office of Historic Preservation
155.OSA	Office of the State Architect
156.OSHA	Occupational Safety and Health Administration
157.P2P	Peer-to-Peer Program
158.P&P	Policy & Procedure
159.PCH	Pacific Coast Highway
160.PCMS	Portable Changeable Message Sign
161.PDO	Property Damage Only
162.PE	Professional Engineer or Project Engineer
163.Ped or PED	Pedestrian
164.PHF	Peak Hour Factor
165.PHI	Point of Historic Interest
166.PM	Post Mile
167.PMS	Pavement Management System
168.PMT	Passenger Miles Traveled
169.PS&E	Plans, Specifications, and Estimate
170.Pvmt or PVMT	Pavement

171.PUC	California Public Utilities Commission
172.R&D	Research and Development
173.RCE	Registered Civil Engineer
174.RE	Resident Engineer or Right of Entry
175.ROW	Right of Way
176.RR	Railroad
177.Rte or RTE	Route or Registered Traffic Engineer
178.RV	Recreational Vehicle
179.R/W	Right of Way
180.Rwy	Railway
181.RXR	Railroad Crossing
182.S&H Code	Streets & Highways Code
183.SACOG	Sacramento Area Council of Governments
184.SAFE	Service Authority for Freeways & Expressways
185.SB	Southbound or Senate Bill
186.SCAG	Southern California Association of Governments
187.SCRRA	Southern California Regional Rail Authority
188.SCRTD	Southern California Rapid Transit District
189.SHELL	State Highway Extra Legal Loads
190.SHL	State Historical Landmark
191.SHOPP	State Highway Operation and Protection Program
192.SHS	Standard Highway Signs and Markings book (FHWA)
193.SISafety Index or	International System of Units (Metric)
194.SR	State Route or Senate Resolution
195.SRRA	Safety Roadside Rest Area
196.SSD	Stopping Sight Distance
197.SSP's	Standard Special Provisions
198.STA	State Transit Assistance
199.STIP	State Transportation Improvement Program
200.Str or STR	Structure
201.SW	Sidewalk or Soundwall
202.SWITRS	Statewide Integrated Traffic Records Systems
203.TASAS	Traffic Accident Surveillance and Analysis System
204.TC	Traffic Control
205.TCM	Transportation Control Measure
206.TCP	Traffic/Transportation Control Plan
207.TEA21	Transportation Efficiency Act for the 21st Century
208.Temp or TEMP	Temporary
209.TITraffic Index	
210.TM	Caltrans Traffic Manual
211.TMC	Traffic Management Center
212.TMP	Transportation Management Plan
213.TMT	Traffic Management Team
214.TODS	Tourist-Oriented Directional Signs
215.TOPD	Traffic Operations Policy Directives
216.TOS	Traffic Operations System
217.TRB	Transportation Research Board
218.TS	Traffic Signal
219.TSS	Caltrans Traffic Sign Specifications
220.TTC	Temporary Traffic Control
221.UC	Under Crossing
222.UP	Underpass
223.UPRR	Union Pacific Railroad

224.URR	Urban Rail Transit Program (State)
225.USA	Underground Service Alert
226.USC	United States Code (Federal)
227.USCE	United States (Army) Corps of Engineers (Federal)
228.USDOT	United States Department of Transportation
229.VMS	Variable Message Sign
230.VMT	Vehicle Miles Traveled
231.vph or VPH	Vehicles Per Hour
232.vphpl or VPHPL	Vehicles Per Hour Per Lane
233.WATCH	Work Area Traffic Control Handbook
234.WIM	Weigh-in Motion
235.WS	White Stripe
236.Xing or XING	Crossing
237.YS	Yellow Stripe

### **Section 1A.15 Abbreviations Used on Traffic Control Devices**

#### **Standard:**

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

**02 When the word messages shown in Table 1A-2 need to be abbreviated on a portable changeable message sign, the abbreviations shown in Table 1A-2 shall be used. Unless indicated by an asterisk, these abbreviations shall only be used on portable changeable message signs.**

#### *Guidance:*

*03 The abbreviations for the words listed in Table 1A-2 that also show a prompt word should not be used on a portable changeable message sign unless the prompt word shown in Table 1A-2 either precedes or follows the abbreviation, as applicable.*

#### **Standard:**

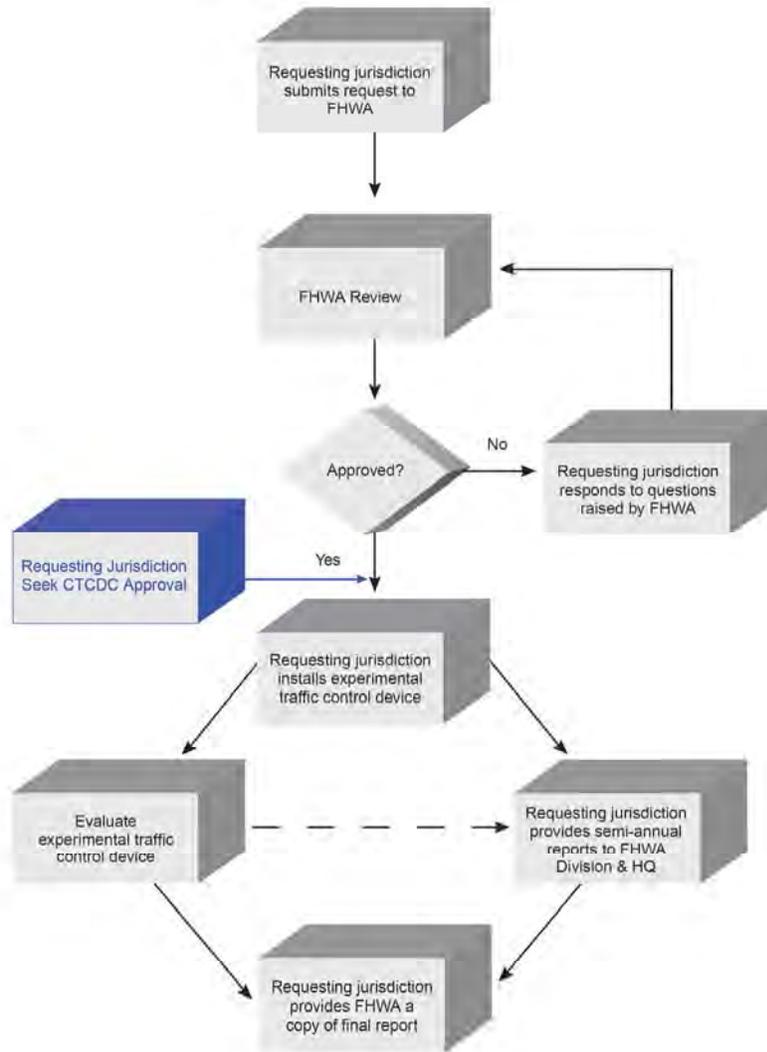
**04 The abbreviations shown in Table 1A-3 shall not be used in connection with traffic control devices because of their potential to be misinterpreted by road users.**

#### *Guidance:*

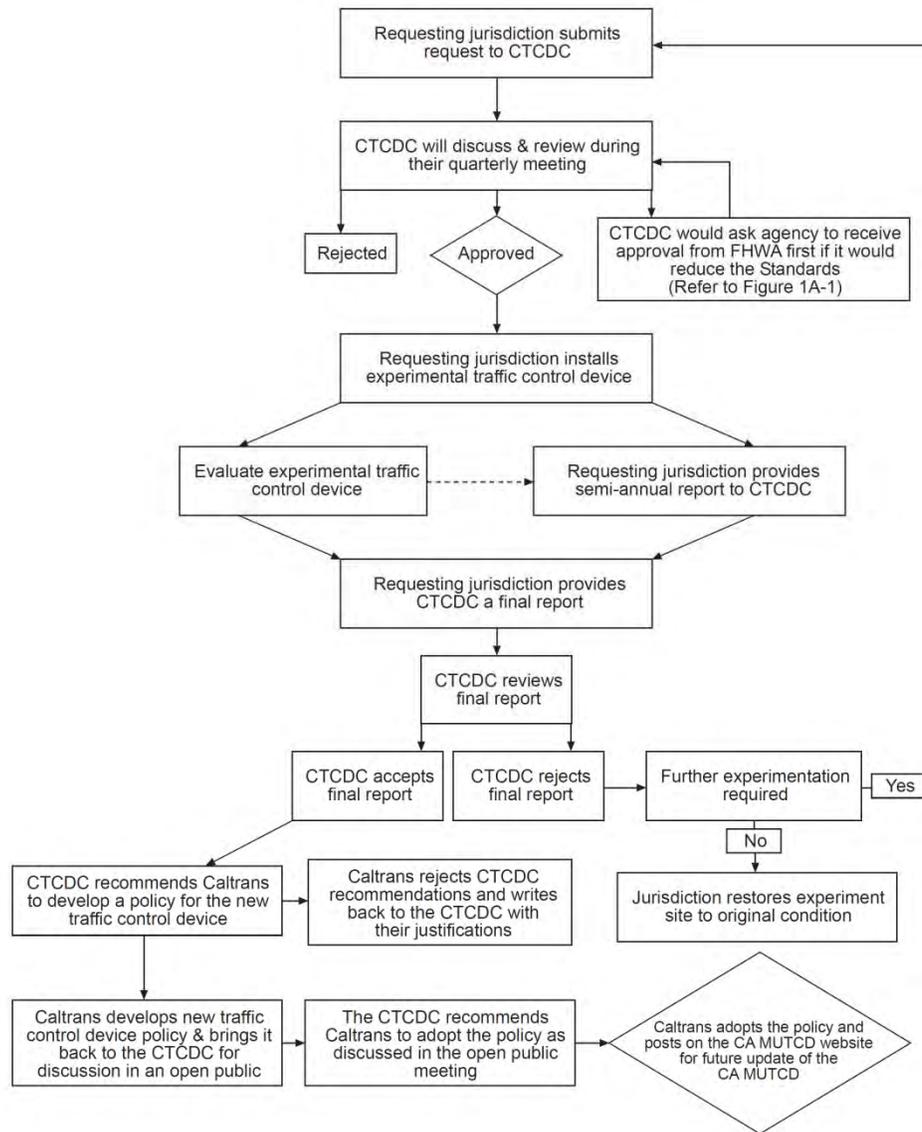
*05 If multiple abbreviations are permitted in Table 1A-1 or 1A-2, the same abbreviation should be used throughout a single jurisdiction.*

*06 Except as otherwise provided in Table 1A-1 or 1A-2 or unless necessary to avoid confusion, periods, commas, apostrophes, question marks, ampersands, and other punctuation marks or characters that are not letters or numerals should not be used in any abbreviation.*

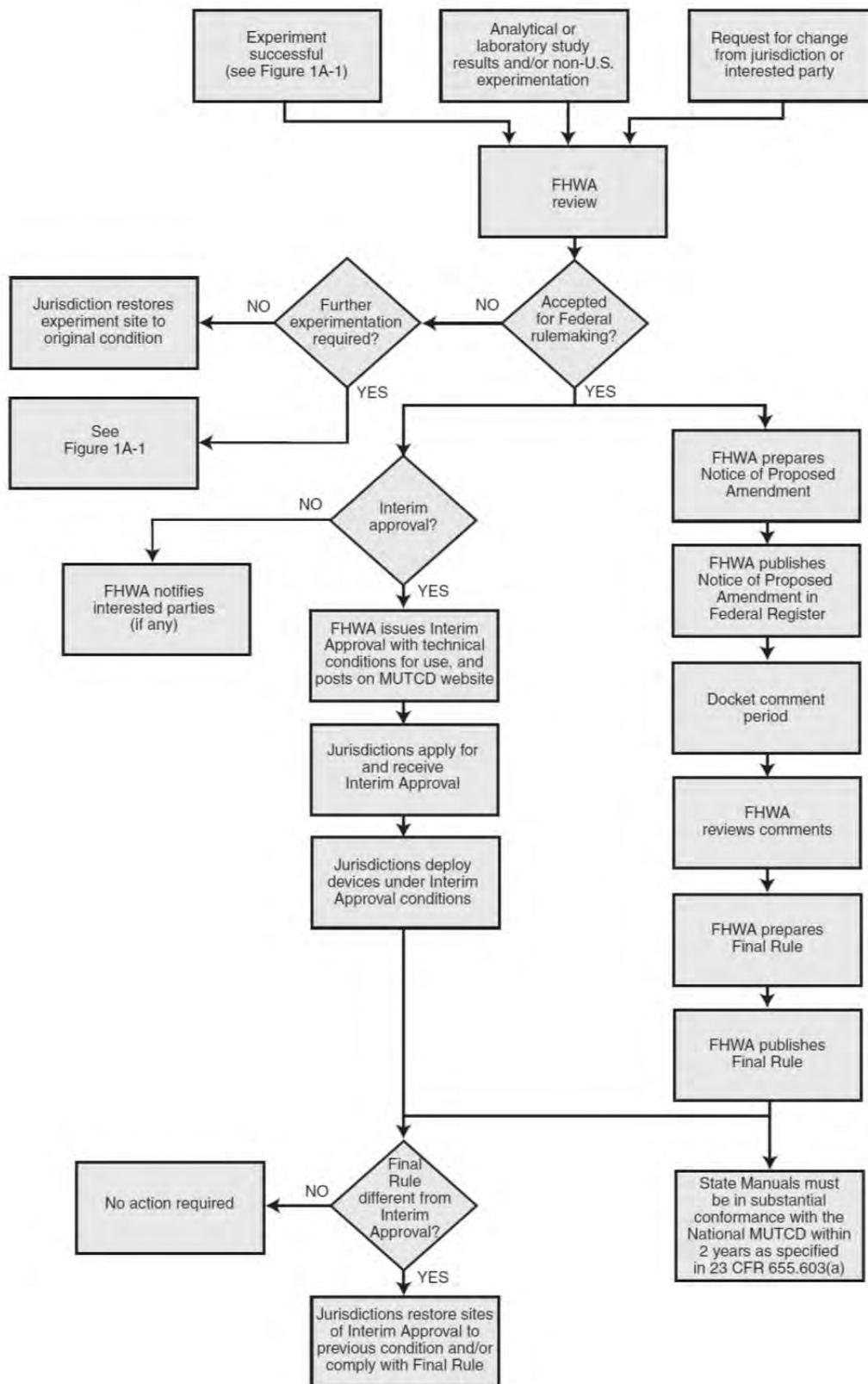
**Figure 1A-1. Process for Requesting and Conducting Experimentations for New Traffic Control Devices**



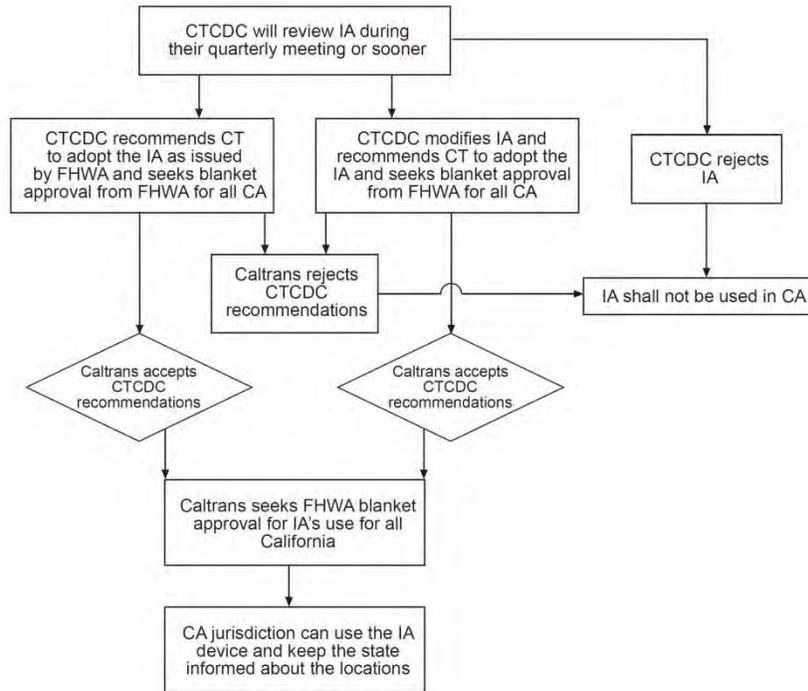
**Figure 1A-1 (CA). Process for Requesting and Conducting Experimentations for New Traffic Control Devices in California**



**Figure 1A-2. Process for Incorporating New Traffic Control Devices into the MUTCD**



**Figure 1A-101 (CA). Process for the Use of Traffic Control Devices in California Approved as Interim Approval (IA) by FHWA**



**Table 1A-1. Acceptable Abbreviations**

Word Message	Standard Abbreviation
Afternoon / Evening	PM
Alternate	ALT
AM Radio	AM
Avenue	AVE, AV
Bicycle	BIKE
Boulevard	BLVD*
Bridge	(See Table 1A-2)
CB Radio	CB
Center (as part of a place name)	CTR
Circle	CIR*
Civil Defense	CD
Compressed Natural Gas	CNG
Court	CT*
Crossing (other than highway-rail)	X-ING
Drive	DR*
East	E
Electric Vehicle	EV
Expressway	EXPWY*
Feet	FT
FM Radio	FM
Freeway	FRWY, FWY*
Friday	FRI
Hazardous Material	HAZMAT
High Occupancy Vehicle	HOV

Word Message	Standard Abbreviation
Highway	HWY*
Hospital	HOSP
Hour(s)	HR, HRS
Information	INFO
Inherently Low Emission Vehicle	ILEV
International	INTL
Interstate	(See Table 1A-2)
Junction / Intersection	JCT
Lane	(See Table 1A-2)
Liquid Propane Gas	LP-GAS
Maximum	MAX
Mile(s)	MI
Miles Per Hour	MPH
Minimum	MIN
Minute(s)	MIN
Monday	MON
Morning / Late Night	AM
Mount	MT
Mountain	MTN
National	NATL
North	N
Parkway	PKWY*
Pedestrian	PED
Place	PL*

Word Message	Standard Abbreviation
Pounds	LBS
Road	RD*
Saint	ST
Saturday	SAT
South	S
State, county, or other non-US or non-Interstate numbered route	(See Table 1A-2)
Street	ST*
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Terrace	TER*
Thursday	THURS
Thruway	THWY*
Tons of Weight	T
Trail	TR*
Tuesday	TUES
Turnpike	TPK*
Two-Way Intersection	2-WAY
US Numbered Route	US
Wednesday	WED
West	W

\*This abbreviation shall not be used for any application other than the name of a roadway.

**Table 1A-2. Abbreviations That Shall be Used Only on Portable Changeable Message Signs**

Word Message	Standard Abbreviation	Prompt Word That Should Precede the Abbreviation	Prompt Word That Should Follow the Abbreviation
Access	ACCS	—	Road
Ahead	AHD	Fog	—
Blocked	BLKD	Lane	—
Bridge	BR*	[Name]	—
Cannot	CANT	—	—
Center	CNTR	—	Lane
Chemical	CHEM	—	Spill
Condition	COND	Traffic	—
Congested	CONG	Traffic	—
Construction	CONST	—	Ahead
Crossing	XING	—	—
Do Not	DONT	—	—
Downtown	DWNTN	—	Traffic
Eastbound	E-BND	—	—
Emergency	EMER	—	—
Entrance, Enter	ENT	—	—
Exit	EX	Next	—
Express	EXP	—	Lane
Frontage	FRNTG	—	Road
Hazardous	HAZ	—	Driving
Highway-Rail Grade Crossing	RR XING	—	—
Interstate	I-*	—	[Number]
It Is	ITS	—	—
Lane	LN	[Roadway Name], Right, Left, Center	—
Left	LFT	—	—
Local	LOC	—	Traffic
Lower	LWR	—	Level
Maintenance	MAINT	—	—
Major	MAJ	—	Accident
Minor	MNR	—	Accident
Normal	NORM	—	—
Northbound	N-BND	—	—
Oversized	OVRSZ	—	Load
Parking	PKING	—	—
Pavement	PVMT	Wet	—
Prepare	PREP	—	To Stop
Quality	QLTY	Air	—
Right	RT	Keep, Next	—
Right	RT	—	Lane
Roadwork	RDWK	—	Ahead, [Distance]
Route	RT, RTE	Best	—
Service	SERV	—	—
Shoulder	SHLDR	—	—
Slippery	SLIP	—	—
Southbound	S-BND	—	—
Speed	SPD	—	—
State, county, or other non-US or non-Interstate numbered route	[Route Abbreviation determined by highway agency]**	—	[Number]
Tires With Lugs	LUGS	—	—
Traffic	TRAF	—	—
Travelers	TRVLRS	—	—
Two-Wheeled Vehicles	CYCLES	—	—
Upper	UPR	—	Level
Vehicle(s)	VEH, VEHS	—	—
Warning	WARN	—	—
Westbound	W-BND	—	—
Will Not	WONT	—	—

\* This abbreviation, when accompanied by the prompt word, may be used on traffic control devices other than portable changeable message signs.

\*\* A space and no dash shall be placed between the abbreviation and the number of the route.

**Table 1A-3. Unacceptable Abbreviations**

<b>Abbreviation</b>	<b>Intended Word</b>	<b>Common Misinterpretation</b>
ACC	Accident	Access (Road)
CLRS	Clears	Colors
DLY	Delay	Daily
FDR	Feeder	Federal
L	Left	Lane (Merge)
LT	Light (Traffic)	Left
PARK	Parking	Park
POLL	Pollution (Index)	Poll
RED	Reduce	Red
STAD	Stadium	Standard
WRNG	Warning	Wrong

# PART 6

## TEMPORARY TRAFFIC CONTROL

### CHAPTER 6A. GENERAL

#### Section 6A.01 General

Support:

<sup>01</sup> Whenever the acronym “TTC” is used in Part 6, it refers to “temporary traffic control.”

**Standard:**

<sup>02</sup> **The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, or on private roads open to public travel (see definition in Section 1A.13), including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.**

Support:

<sup>03</sup> When the normal function of the roadway, or a private road open to public travel, is suspended, TTC planning provides for continuity of the movement of motor vehicle, bicycle, and pedestrian traffic (including accessible passage); transit operations; and access (and accessibility) to property and utilities.

<sup>04</sup> The primary function of TTC is to provide for the reasonably safe and effective movement of road users through or around TTC zones while reasonably protecting road users, workers, responders to traffic incidents, and equipment.

<sup>05</sup> Of equal importance to the public traveling through the TTC zone is the safety of workers performing the many varied tasks within the work space. TTC zones present constantly changing conditions that are unexpected by the road user. This creates an even higher degree of vulnerability for the workers and incident management responders on or near the roadway (see Section 6D.03). At the same time, the TTC zone provides for the efficient completion of whatever activity interrupted the normal use of the roadway.

<sup>06</sup> Consideration for road user safety, worker and responder safety, and the efficiency of road user flow is an integral element of every TTC zone, from planning through completion. A concurrent objective of the TTC is the efficient construction and maintenance of the highway and the efficient resolution of traffic incidents.

<sup>07</sup> No one set of TTC devices can satisfy all conditions for a given project or incident. At the same time, defining details that would be adequate to cover all applications is not practical. Instead, Part 6 displays typical applications that depict common applications of TTC devices. The TTC selected for each situation depends on type of highway, road user conditions, duration of operation, physical constraints, and the nearness of the work space or incident management activity to road users.

<sup>08</sup> Improved road user performance might be realized through a well-prepared public relations effort that covers the nature of the work, the time and duration of its execution, the anticipated effects upon road users, and possible alternate routes and modes of travel. Such programs have been found to result in a significant reduction in the number of road users traveling through the TTC zone, which reduces the possible number of conflicts.

<sup>09</sup> Operational improvements might be realized by using intelligent transportation systems (ITS) in work zones. The use in work zones of ITS technology, such as portable camera systems, highway advisory radio, variable speed limits, ramp metering, traveler information, merge guidance, and queue detection information, is aimed at increasing safety for both workers and road users and helping to ensure a more efficient traffic flow. The use in work zones of ITS technologies has been found to be effective in providing traffic monitoring and management, data collection, and traveler information.

**Standard:**

<sup>10</sup> **TTC plans and devices shall be the responsibility of the authority of a public body or official having jurisdiction for guiding road users. There shall be adequate statutory authority for the implementation and enforcement of needed road user regulations, parking controls, speed zoning, and the management of**

**traffic incidents. Such statutes shall provide sufficient flexibility in the application of TTC to meet the needs of changing conditions in the TTC zone.**

**Support:**

<sup>11</sup> Temporary facilities, including pedestrian routes around worksites, are also covered by the accessibility requirements of the Americans with Disabilities Act of 1990 (ADA) (Public Law 101-336, 104 Stat. 327, July 26, 1990, 42 U.S.C. 12101-12213 (as amended)).

**Guidance:**

<sup>12</sup> *The TTC plan should start in the planning phase and continue through the design, construction, and restoration phases. The TTC plans and devices should follow the principles set forth in Part 6. The management of traffic incidents should follow the principles set forth in Chapter 6I.*

**Option:**

<sup>13</sup> TTC plans may deviate from the typical applications described in Chapter 6H to allow for conditions and requirements of a particular site or jurisdiction.

**Support:**

<sup>14</sup> The provisions of Part 6 apply to both rural and urban areas. A rural highway is normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians. An urban street is typically characterized by relatively low speeds, wide ranges of road user volumes, narrower roadway lanes, frequent intersections and driveways, significant pedestrian activity, and more businesses and houses.

<sup>15</sup> The determination as to whether a particular facility at a particular time of day can be considered to be a high-volume roadway or can be considered to be a low-volume roadway is made as defined in Part 5 by the public agency or official having jurisdiction.

<sup>16</sup> Per the provisions of the Construction Safety Orders in the California Code of Regulations (Title 8, Division 1, Chapter 4, Subchapter 4, Article 11, Sections 1598 and 1599), this Part of the California MUTCD is incorporated by reference as part of those regulations.

<sup>17</sup> It is the responsibility of the Contractor or Organization performing work on, or adjacent to, a highway to install and maintain such devices which are necessary to provide passage for the traveling public (including pedestrians and bicyclists) through the work, as well as for the safeguard of workers.

**Standard:**

<sup>18</sup> **Before work begins, traffic control plans, when developed for handling traffic through a construction or maintenance project, shall be approved by the Engineer of the public agency or authority having jurisdiction over the highway.**

**Support:**

<sup>19</sup> The following references from the California Vehicle Code (CVC) relate to TTC:

- Section 112 – Amber.
- Section 165 – Authorized Emergency Vehicle.
- Section 291 – Department of Transportation.
- Section 385 – Local Authorities.
- Section 21351.3 – Use of Metric System Designations.
- Section 21363 – Detour Signs.
- Section 21367 – Traffic Control: Highway Construction.
- Section 21466.5 – Light Impairing Driver's Vision.
- Section 22362 – Speed Limit Where Persons at Work.

## CHAPTER 6B. FUNDAMENTAL PRINCIPLES

### Section 6B.01 Fundamental Principles of Temporary Traffic Control

#### Support:

<sup>01</sup> Construction, maintenance, utility, and incident zones can all benefit from TTC to compensate for the unexpected or unusual situations faced by road users. When planning for TTC in these zones, it can be assumed that it is appropriate for road users to exercise caution. Even though road users are assumed to be using caution, special care is still needed in applying TTC techniques.

<sup>02</sup> Special plans preparation and coordination with transit, other highway agencies, law enforcement and other emergency units, utilities, schools, and railroad companies might be needed to reduce unexpected and unusual road user operation situations.

<sup>03</sup> During TTC activities, commercial vehicles might need to follow a different route from passenger vehicles because of bridge, weight, clearance, or geometric restrictions. Also, vehicles carrying hazardous materials might need to follow a different route from other vehicles. The Hazardous Materials and National Network signs are included in Sections 2B.62 and 2B.63, respectively.

<sup>04</sup> Experience has shown that following the fundamental principles of Part 6 will assist road users and help protect workers in the vicinity of TTC zones.

#### Guidance:

<sup>05</sup> *Road user and worker safety and accessibility in TTC zones should be an integral and high-priority element of every project from planning through design and construction. Similarly, maintenance and utility work should be planned and conducted with the safety and accessibility of all motorists, bicyclists, pedestrians (including those with disabilities), and workers being considered at all times. If the TTC zone includes a grade crossing, early coordination with the railroad company or light rail transit agency should take place.*

#### Support:

<sup>06</sup> Formulating specific plans for TTC at traffic incidents is difficult because of the variety of situations that can arise.

#### Guidance:

<sup>07</sup> *The following are the seven fundamental principles of TTC:*

1. *General plans or guidelines should be developed to provide safety for motorists, bicyclists, pedestrians, workers, enforcement/emergency officials, and equipment, with the following factors being considered:*
  - A. *The basic safety principles governing the design of permanent roadways and roadsides should also govern the design of TTC zones. The goal should be to route road users through such zones using roadway geometrics, roadside features, and TTC devices as nearly as possible comparable to those for normal highway situations.*
  - B. *A TTC plan, in detail appropriate to the complexity of the work project or incident, should be prepared and understood by all responsible parties before the site is occupied.*

#### Standard:

**Any changes in the TTC plan shall be approved by an official who is knowledgeable (for example, trained and/or certified) in proper TTC practices the Engineer of the public agency or authority having jurisdiction over the highway.**

#### Guidance:

2. *Road user movement should be inhibited as little as practical, based on the following considerations:*
  - A. *TTC at work and incident sites should be designed on the assumption that drivers will only reduce their speeds if they clearly perceive a need to do so (see Section 6C.01).*
  - B. *Frequent and abrupt changes in geometrics such as lane narrowing, dropped lanes, or main roadway transitions that require rapid maneuvers, should be avoided.*
  - C. *Work should be scheduled in a manner that minimizes the need for lane closures or alternate routes, while still getting the work completed quickly and the lanes or roadway open to traffic as soon as possible.*
  - D. *Attempts should be made to reduce the volume of traffic using the roadway or freeway to match the restricted capacity conditions. Road users should be encouraged to use alternative routes. For high-*

- volume roadways and freeways, the closure of selected entrance ramps or other access points and the use of signed diversion routes should be evaluated.*
- E. Bicyclists and pedestrians, including those with disabilities, should be provided with access and reasonably safe passage through the TTC zone.*
  - F. If work operations permit, lane closures on high-volume streets and highways should be scheduled during off-peak hours. Night work should be considered if the work can be accomplished with a series of short-term operations.*
  - G. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur if significant impacts to roadway operations are anticipated.*
3. *Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner while approaching and traversing TTC zones and incident sites. The following principles should be applied:*
- A. Adequate warning, delineation, and channelization should be provided to assist in guiding road users in advance of and through the TTC zone or incident site by using proper pavement marking, signing, or other devices that are effective under varying conditions. Providing information that is in usable formats by pedestrians with visual disabilities should also be considered.*
  - B. TTC devices inconsistent with intended travel paths through TTC zones should be removed or covered. However, in intermediate-term stationary, short-term, and mobile operations, where visible permanent devices are inconsistent with intended travel paths, devices that highlight or emphasize the appropriate path should be used. Providing traffic control devices that are accessible to and usable by pedestrians with disabilities should be considered.*
  - C. Flagging procedures, when used, should provide positive guidance to road users traversing the TTC zone.*
4. *To provide acceptable levels of operations, routine day and night inspections of TTC elements should be performed as follows:*
- A. Individuals who are knowledgeable (for example, trained and/or certified) in the principles of proper TTC should be assigned responsibility for safety in TTC zones. The most important duty of these individuals should be to check that all TTC devices of the project are consistent with the TTC plan and are effective for motorists, bicyclists, pedestrians, and workers.*
  - B. As the work progresses, temporary traffic controls and/or working conditions should be modified, if appropriate, in order to provide mobility and positive guidance to the road user and to provide worker safety. The individual responsible for TTC should have the authority to halt work until applicable or remedial safety measures are taken.*
  - C. TTC zones should be carefully monitored under varying conditions of road user volumes, light, and weather to check that applicable TTC devices are effective, clearly visible, clean, and in compliance with the TTC plan.*
  - D. When warranted, an engineering study should be made (in cooperation with law enforcement officials) of reported crashes occurring within the TTC zone. Crash records in TTC zones should be monitored to identify the need for changes in the TTC zone.*
5. *Attention should be given to the maintenance of roadside safety during the life of the TTC zone by applying the following principles:*
- A. To accommodate run-off-the-road incidents, disabled vehicles, or emergency situations, unencumbered roadside recovery areas or clear zones should be provided where practical.*
  - B. Channelization of road users should be accomplished by the use of pavement markings, signing, and crashworthy, detectable channelizing devices.*
  - C. Work equipment, workers' private vehicles, materials, and debris should be stored in such a manner to reduce the probability of being impacted by run-off-the-road vehicles.*
6. *Each person whose actions affect TTC zone safety, from the upper-level management through the field workers, should receive training appropriate to the job decisions each individual is required to make. Only those individuals who are trained in proper TTC practices and have a basic understanding of the principles (established by applicable standards and guidelines, including those of this Manual) should supervise the selection, placement, and maintenance of TTC devices used for TTC zones and for incident management.*

7. *Good public relations should be maintained by applying the following principles:*

- A. *The needs of all road users should be assessed such that appropriate advance notice is given and clearly defined alternative paths are provided.*
- B. *The cooperation of the various news media should be sought in publicizing the existence of and reasons for TTC zones because news releases can assist in keeping the road users well informed.*
- C. *The needs of abutting property owners, residents, and businesses should be assessed and appropriate accommodations made.*
- D. *The needs of emergency service providers (law enforcement, fire, and medical) should be assessed and appropriate coordination and accommodations made.*
- E. *The needs of railroads and transit should be assessed and appropriate coordination and accommodations made.*
- F. *The needs of operators of commercial vehicles such as buses and large trucks should be assessed and appropriate accommodations made.*

Option:

- G. *Public Information - Improved driver performance may be realized through a well-prepared and complete public relations effort that covers the nature of the work, the time and duration of its execution, its anticipated effects on traffic, and possible alternate routes and modes of travel. Such programs can encourage the use of alternate routes, thus allowing consideration of temporary lane closures for additional buffer space.*

**Standard:**

- 08 Before any new detour or temporary route is opened to traffic, all necessary signs shall be in place.**
- 09 All TTC devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, TTC devices that are no longer appropriate shall be removed or covered.**
- 10 On State highways, covers for TTC signs shall be of sufficient size and density to completely block out the message so that it is not visible either during the day or at night. Covers shall be fastened securely to prevent movement caused by wind action. Refer to Department of Transportation's Standard Specifications Section 12-3.06. See Section 1A.11 for information regarding this publication.**

Support:

- 11 Refer to Department of Transportation's Highway Design Manual Section 110.7 for Traffic Control Plans. Refer to Department of Transportation's Transportation Management Plan Guidelines for Temporary Traffic Control Zone Transportation Management Plan. See Section 1A.11 for information regarding this publication.**



## CHAPTER 6C. TEMPORARY TRAFFIC CONTROL ELEMENTS

### Section 6C.01 Temporary Traffic Control Plans

#### Support:

01 A TTC plan describes TTC measures to be used for facilitating road users through a work zone or an incident area. TTC plans play a vital role in providing continuity of effective road user flow when a work zone, incident, or other event temporarily disrupts normal road user flow. Important auxiliary provisions that cannot conveniently be specified on project plans can easily be incorporated into Special Provisions within the TTC plan.

02 TTC plans range in scope from being very detailed to simply referencing typical drawings contained in this Manual, standard approved highway agency drawings and manuals, or specific drawings contained in the contract documents. The degree of detail in the TTC plan depends entirely on the nature and complexity of the situation.

#### Guidance:

03 *TTC plans should be prepared by persons knowledgeable (for example, trained and/or certified) about the fundamental principles of TTC and work activities to be performed. The design, selection, and placement of TTC devices for a TTC plan should be based on engineering judgment.*

04 *Coordination should be made between adjacent or overlapping projects to check that duplicate signing is not used and to check compatibility of traffic control between adjacent or overlapping projects.*

05 *Traffic control planning should be completed for all highway construction, utility work, maintenance operations, and incident management including minor maintenance and utility projects prior to occupying the TTC zone. Planning for all road users should be included in the process.*

06 *Provisions for effective continuity of accessible circulation paths for pedestrians should be incorporated into the TTC process. Where existing pedestrian routes are blocked or detoured, information should be provided about alternative routes that are usable by pedestrians with disabilities, particularly those who have visual disabilities. Access to temporary bus stops, travel across intersections with accessible pedestrian signals (see Section 4E.09), and other routing issues should be considered where temporary pedestrian routes are channelized. Barriers and channelizing devices that are detectable by people with visual disabilities should be provided.*

#### Option:

07 Provisions may be incorporated into the project bid documents that enable contractors to develop an alternate TTC plan.

08 Modifications of TTC plans may be necessary because of changed conditions or a determination of better methods of safely and efficiently handling road users.

#### Guidance:

#### Standard:

**09 This alternate or modified plan ~~should~~ shall have the approval of the Engineer of the public agency or authority having jurisdiction over the highway ~~responsible highway agency~~ prior to implementation.**

#### Guidance:

10 *Provisions for effective continuity of transit service should be incorporated into the TTC planning process because often public transit buses cannot efficiently be detoured in the same manner as other vehicles (particularly for short-term maintenance projects). Where applicable, the TTC plan should provide for features such as accessible temporary bus stops, pull-outs, and satisfactory waiting areas for transit patrons, including persons with disabilities, if applicable (see Section 8A.08 for additional light rail transit issues to consider for TTC).*

11 *Provisions for effective continuity of railroad service and acceptable access to abutting property owners and businesses should also be incorporated into the TTC planning process.*

12 *Reduced speed limits should be used only in the specific portion of the TTC zone where conditions or restrictive features are present. However, frequent changes in the speed limit should be avoided. A TTC plan should be designed so that vehicles can travel through the TTC zone with a speed limit reduction of no more than 10 mph.*

*13 A reduction of more than 10 mph in the speed limit should be used only when required by restrictive features in the TTC zone. Where restrictive features justify a speed reduction of more than 10 mph, additional driver notification should be provided. The speed limit should be stepped down in advance of the location requiring the lowest speed, and additional TTC warning devices should be used.*

*14 Reduced speed zoning (lowering the regulatory speed limit) should be avoided as much as practical because drivers will reduce their speeds only if they clearly perceive a need to do so.*

**Standard:**

**14a The justification for the reduced speed limit shall be documented in writing, in satisfaction of the Engineering and Traffic Survey (E&TS) requirement. Refer to CVC 627 for E&TS.**

**Support:**

15 Research has demonstrated that large reductions in the speed limit, such as a 30 mph reduction, increase speed variance and the potential for crashes. Smaller reductions in the speed limit of up to 10 mph cause smaller changes in speed variance and lessen the potential for increased crashes. A reduction in the regulatory speed limit of only up to 10 mph from the normal speed limit has been shown to be more effective.

**Support:**

16 See Section 2B.13 for permanent Speed Limit and Speed Zone signs.

17 See Section 6F.12 for Road Work/Speed Zone (C17(CA)) sign, WORK ZONE (G20-5aP) plaque and END WORK ZONE SPEED LIMIT (R2-12) sign.

**Construction Speed Zones:**

18 Construction speed zones are established on roads under construction where reduced speed is necessary to limit the risk of an accident to workers and the traveling public during all hours of the day and night. Refer to CVC Section 21367. Protection of workers during working hours is provided for under CVC Section 22362.

**Guidance:**

*19 Construction speed zones should be avoided if traffic can be controlled by other means. Speed restrictions should be imposed on the public only when necessary for worker or public safety.*

**Standard:**

**20 Where traffic obstructions exist only during the hours of construction, the speed zone signs shall be covered during non-working hours.**

**Support:**

21 CVC 22362 applies to "When Workers are Present" condition and signs need to be covered or removed when no work is in progress. As per CVC 21367, agency can "...regulate the movement of traffic...whenever the traffic would endanger the safety of workers or the work would interfere with or endanger the movement of traffic through the area." If obstructions would be present throughout the project duration the signs would not need to be covered or removed. This would also apply to situations where the construction work changes the highway configuration, curvature or elevation, making it necessary to post reduced speed limits.

**Guidance:**

*22 The traveled way should be signed and delineated to communicate physical conditions to the motorists such as curvature, narrow roadways, detours, rough roads, dips or humps, etc.*

**Option:**

23 The Advisory Speed (W13-1) plaque may be used in combination with various warning type signs to decrease speed at a particular location.

**Guidance:**

*24 To preserve the effectiveness of the W13-1 plaque, it should not be used unless the condition to which it applies is immediate and will be experienced by all motorists.*

**Option:**

25 Reduced speed limits in construction zones may be established by an engineering analysis, which may include a traffic and engineering survey.

**Guidance:**

*26 Construction zone speed limits should be reduced in sequential stages and where overall reduction of 15 mph or more is required. The first stage of the sequence should be a reduction of 10 mph and the final stage reduction should be 10 mph or 5 mph, as necessary.*

**Standard:**

**<sup>27</sup> The reduced speed limit shall not be less than 25 mph. Refer to CVC 22362.**

**Option:**

<sup>28</sup> As an example, if the project falls within an established 55 mph zone, and a 40 mph speed limit is considered necessary, it may be posted only if the approaching speed limits are lowered in two stages (i.e., first to a 45 mph speed limit followed by a reduction to the desired 40 mph.

**Guidance:**

<sup>29</sup> *Speed Limit and End Zone signs should be installed at locations jointly agreed upon by the Traffic Engineer and the Construction Engineer.*

**Support:**

<sup>30</sup> Orders for construction speed zones are ordinarily issued for the entire length of the construction project. This avoids the necessity and resulting delay of obtaining a new order each time the speed restriction signs require relocation to fit the conditions. It is not the intention, however, that the entire length be posted for the duration of the contract.

**Standard:**

**<sup>31</sup> Speed restriction signs shall be posted only in areas where the traveling public is affected by construction operations.**

**Guidance:**

<sup>32</sup> *As the construction progresses, signs should be moved as appropriate.*

**Standard:**

**<sup>33</sup> Signs shall be used only during working hours and removed, or covered during non-working hours unless the movement of traffic through the TTC zone is affected during non-working hours as well. Refer to CVC 21367.**

**<sup>34</sup> Signs shall be removed immediately following completion of the construction or change in the conditions for which they were installed. When the construction is completed or the speed restriction is no longer necessary, the formal speed zone orders shall be revoked.**

## **Section 6C.02 Temporary Traffic Control Zones**

**Support:**

<sup>01</sup> A TTC zone is an area of a highway where road user conditions are changed because of a work zone, an incident zone, or a planned special event through the use of TTC devices, uniformed law enforcement officers, or other authorized personnel.

<sup>02</sup> A work zone is an area of a highway with construction, maintenance, or utility work activities. A work zone is typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to the END ROAD WORK sign or the last TTC device.

<sup>03</sup> An incident zone is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a traffic incident (see Section 6I.01). It extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where road users return to the original lane alignment and are clear of the incident.

<sup>04</sup> A planned special event often creates the need to establish altered traffic patterns to handle the increased traffic volumes generated by the event. The size of the TTC zone associated with a planned special event can be small, such as closing a street for a festival, or can extend throughout a municipality for larger events. The duration of the TTC zone is determined by the duration of the planned special event.

## **Section 6C.03 Components of Temporary Traffic Control Zones**

**Support:**

<sup>01</sup> Most TTC zones are divided into four areas: the advance warning area, the transition area, the activity area, and the termination area. Figure 6C-1 illustrates these four areas. These four areas are described in Sections 6C.04 through 6C.07.

### **Section 6C.04 Advance Warning Area**

**Support:**

01 The advance warning area is the section of highway where road users are informed about the upcoming work zone or incident area.

**Option:**

02 The advance warning area may vary from a single sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to a series of signs in advance of the TTC zone activity area.

**Guidance:**

03 *Typical distances for placement of advance warning signs on freeways and expressways should be longer because drivers are conditioned to uninterrupted flow. Therefore, the advance warning sign placement should extend on these facilities as far as 1/2 mile or more.*

04 *On urban streets, the effective placement of the first warning sign in feet should range from 4 to 8 times the speed limit in mph, with the high end of the range being used when speeds are relatively high. When a single advance warning sign is used (in cases such as low-speed residential streets), the advance warning area can be as short as 100 feet. When two or more advance warning signs are used on higher-speed streets, such as major arterials, the advance warning area should extend a greater distance (see Table 6C-1).*

05 *Since rural highways are normally characterized by higher speeds, the effective placement of the first warning sign in feet should be substantially longer—from 8 to 12 times the speed limit in mph. Since two or more advance warning signs are normally used for these conditions, the advance warning area should extend 1,500 feet or more for open highway conditions (see Table 6C-1).*

06 *The distances contained in Table 6C-1 are approximate, are intended for guidance purposes only, and should be applied with engineering judgment. These distances should be adjusted for field conditions, if necessary, by increasing or decreasing the recommended distances.*

**Support:**

07 The need to provide additional reaction time for a condition is one example of justification for increasing the sign spacing. Conversely, decreasing the sign spacing might be justified in order to place a sign immediately downstream of an intersection or major driveway such that traffic turning onto the roadway in the direction of the TTC zone will be warned of the upcoming condition.

**Option:**

08 Advance warning may be eliminated when the activity area is sufficiently removed from the road users' path behind a barrier, more than 2 feet behind the curb, or 15 feet or more from the edge of any roadway so that it does not interfere with the normal flow.

### **Section 6C.05 Transition Area**

**Support:**

01 The transition area is that section of highway where road users are redirected out of their normal path. Transition areas usually involve strategic use of tapers, which because of their importance are discussed separately in detail.

**Standard:**

02 **When redirection of the road users' normal path is required, they shall be directed from the normal path to a new path.**

**Option:**

03 Because it is impractical in mobile operations to redirect the road user's normal path with stationary channelization, more dominant vehicle-mounted traffic control devices, such as arrow boards, portable changeable message signs, and high-intensity rotating, flashing, oscillating, or strobe lights, may be used instead of channelizing devices to establish a transition area.

### **Section 6C.06 Activity Area**

**Support:**

01 The activity area is the section of the highway where the work activity takes place. It is comprised of the work space, the traffic space, and the buffer space.

02 The work space is that portion of the highway closed to road users and set aside for workers, equipment, and material, and a shadow vehicle if one is used upstream. Work spaces are usually delineated for road users by channelizing devices or, to exclude vehicles and pedestrians, by temporary barriers.

Option:

03 The work space may be stationary or may move as work progresses.

Guidance:

04 *Since there might be several work spaces (some even separated by several miles) within the project limits, each work space should be adequately signed to inform road users and reduce confusion.*

Support:

05 The traffic space is the portion of the highway in which road users are routed through the activity area.

06 The buffer space is a lateral and/or longitudinal area that separates road user flow from the work space or an unsafe area, and might provide some recovery space for an errant vehicle.

Guidance:

07 *Neither work activity nor storage of equipment, vehicles, or material should occur within a buffer space.*

Option:

08 Buffer spaces may be positioned either longitudinally or laterally with respect to the direction of road user flow. The activity area may contain one or more lateral or longitudinal buffer spaces.

09 A longitudinal buffer space may be placed in advance of a work space.

Guidance:

10 *The longitudinal buffer space ~~may~~ should also be used to separate opposing road user flows that use portions of the same traffic lane, as shown in Figure 6C-2.*

Option:

11 If a longitudinal buffer space is used, the values shown in Table 6C-2 and Table 6E-101(CA) may be used to determine the length of the longitudinal buffer space.

Support:

12 Typically, the buffer space is formed as a traffic island and defined by channelizing devices.

13 When a shadow vehicle, arrow board, or changeable message sign is placed in a closed lane in advance of a work space, only the area upstream of the vehicle, arrow board, or changeable message sign constitutes the buffer space.

Option:

14 The lateral buffer space may be used to separate the traffic space from the work space, as shown in Figures 6C-1 and 6C-2, or such areas as excavations or pavement edge drop-offs. A lateral buffer space also may be used between two travel lanes, especially those carrying opposing flows.

Guidance:

15 *The width of a lateral buffer space should be determined by engineering judgment.*

Option:

16 When work occurs on a high-volume, highly congested facility, a vehicle storage or staging space may be provided for incident response and emergency vehicles (for example, tow trucks and fire apparatus) so that these vehicles can respond quickly to road user incidents.

### **Section 6C.07 Termination Area**

Support:

01 The termination area is the section of the highway where road users are returned to their normal driving path. The termination area extends from the downstream end of the work area to the last TTC device such as END ROAD WORK signs, if posted.

Option:

02 An END ROAD WORK sign, a Speed Limit sign, or other signs may be used to inform road users that they can resume normal operations.

03 A longitudinal buffer space may be used between the work space and the beginning of the downstream taper.

## Section 6C.08 Tapers

### Option:

01 Tapers may be used in both the transition and termination areas. Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the length of the tapers may be adjusted.

### Support:

02 Tapers are created by using a series of channelizing devices and/or pavement markings to move traffic out of or into the normal path. Types of tapers are shown in Figure 6C-2.

03 Longer tapers are not necessarily better than shorter tapers (particularly in urban areas with characteristics such as short block lengths or driveways) because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily. The test concerning adequate lengths of tapers involves observation of driver performance after TTC plans are put into effect.

### Guidance:

04 *The appropriate taper length (L) should be determined using the criteria shown in Tables 6C-3, 6C-3(CA) and 6C-4.*

05 *The maximum distance in feet between devices in a taper should not exceed 1.0 times the speed limit in mph.*

### Support:

06 A merging taper requires the longest distance because drivers are required to merge into common road space.

### Guidance:

07 *A merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds and merge into an adjacent lane before the downstream end of the transition.*

### Support:

08 A shifting taper is used when a lateral shift is needed. When more space is available, a longer than minimum taper distance can be beneficial. Changes in alignment can also be accomplished by using horizontal curves designed for normal highway speeds.

### Guidance:

09 *A shifting taper should have a length of approximately 1/2 L (see Tables 6C-3, 6C-3(CA) and 6C-4).*

### Support:

10 A shoulder taper might be beneficial on a high-speed roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane. In these instances, the same type, but abbreviated, closure procedures used on a normal portion of the roadway can be used.

### Guidance:

11 *If used, shoulder tapers should have a length of approximately 1/3 L (see Tables 6C-3, 6C-3(CA) and 6C-4). If a shoulder is used as a travel lane, either through practice or during a TTC activity, a normal merging or shifting taper should be used.*

### Support:

12 A downstream taper might be useful in termination areas to provide a visual cue to the driver that access is available back into the original lane or path that was closed.

### Guidance:

13 *If used, a downstream taper should have a minimum length of 50 feet and a maximum length of 100 feet with devices placed at a spacing of approximately 20 feet.*

### Support:

14 The one-lane, two-way taper is used in advance of an activity area that occupies part of a two-way roadway in such a way that a portion of the road is used alternately by traffic in each direction.

### Guidance:

15 *Traffic should be controlled by a flagger or temporary traffic control signal (if sight distance is limited), or a STOP or YIELD sign. A short taper having a minimum length of 50 feet and a maximum length of 100 feet with channelizing devices at approximately 20-foot spacing should be used to guide traffic into the one-lane section, and a downstream taper should be used to guide traffic back into their original lane.*

### Support:

16 An example of a one-lane, two-way traffic taper is shown in Figure 6C-3.

*Guidance:*

*<sup>17</sup> On State highways, Department of Transportation's Standard Plans for Traffic Control Systems (Standard Plans T10 through T17) should be used. See Section 1A.11 for information regarding this publication.*

### **Section 6C.09 Detours and Diversions**

**Support:**

<sup>01</sup> A detour is a temporary rerouting of road users onto an existing highway in order to avoid a TTC zone.

**Guidance:**

<sup>02</sup> Detours should be clearly signed over their entire length so that road users can easily use existing highways to return to the original highway.

**Support:**

<sup>03</sup> A diversion is a temporary rerouting of road users onto a temporary highway or alignment placed around the work area.

**Standard:**

<sup>04</sup> **The detour route shall be evaluated for height, weight, and size restrictions. Appropriate signs shall be posted along the route to advise motorists of any restrictions. Refer to CVC 21363 for detour signs.**

**Option:**

<sup>05</sup> Advance signs or changeable message signs (CMS) may be necessary to give trucks an opportunity to turn around and retrace their path or select another route.

### **Section 6C.10 One-Lane, Two-Way Traffic Control**

**Standard:**

<sup>01</sup> **Except as provided in Paragraph 5, when traffic in both directions must use a single lane for a limited distance, movements from each end shall be coordinated.**

*Guidance:*

<sup>02</sup> *Provisions should be made for alternate one-way movement through the constricted section via methods such as flagger control, a flag transfer, a pilot car, traffic control signals, or stop or yield control.*

<sup>03</sup> *Control points at each end should be chosen to permit easy passing of opposing lanes of vehicles.*

<sup>04</sup> *If traffic on the affected one-lane roadway is not visible from one end to the other, then flagging procedures, a pilot car with a flagger used as described in Section 6C.13, or a traffic control signal should be used to control opposing traffic flows.*

**Option:**

<sup>05</sup> If the work space on a low-volume street or road is short and road users from both directions are able to see the traffic approaching from the opposite direction through and beyond the worksite, the movement of traffic through a one-lane, two-way constriction may be self-regulating.

### **Section 6C.11 Flagger Method of One-Lane, Two-Way Traffic Control**

*Guidance:*

<sup>01</sup> *Except as provided in Paragraph 2, traffic should be controlled by a flagger at each end of a constricted section of roadway. One of the flaggers should be designated as the coordinator. To provide coordination of the control of the traffic, the flaggers should be able to communicate with each other orally, electronically, or with manual signals. These manual signals should not be mistaken for flagging signals.*

**Option:**

<sup>02</sup> When a one-lane, two-way TTC zone is short enough to allow a flagger to see from one end of the zone to the other, traffic may be controlled by either a single flagger or by a flagger at each end of the section.

*Guidance:*

<sup>03</sup> *When a single flagger is used, the flagger should be stationed on the shoulder opposite the constriction or work space, or in a position where good visibility and traffic control can be maintained at all times. When good visibility and traffic control cannot be maintained by one flagger station, traffic should be controlled by a flagger at each end of the section.*

### **Section 6C.12 Flag Transfer Method of One-Lane, Two-Way Traffic Control**

**Support:**

01 The driver of the last vehicle proceeding into the one-lane section is given a red flag (or other token) and instructed to deliver it to the flagger at the other end. The opposite flagger, upon receipt of the flag, then knows that traffic can be permitted to move in the other direction. A variation of this method is to replace the use of a flag with an official pilot car that follows the last road user vehicle proceeding through the section.

**Guidance:**

02 *The flag transfer method should be employed only where the one-way traffic is confined to a relatively short length of a road, usually no more than 1 mile in length.*

### **Section 6C.13 Pilot Car Method of One-Lane, Two-Way Traffic Control**

**Option:**

01 A pilot car may be used to guide a queue of vehicles through the TTC zone or detour.

**Guidance:**

02 *The pilot car should have the name of the contractor or contracting authority prominently displayed.*

**Standard:**

03 **The PILOT CAR FOLLOW ME (G20-4) sign (see Section 6F.58) shall be mounted on the rear of the pilot vehicle.**

04 **A flagger shall be stationed on the approach to the activity area to control vehicular traffic until the pilot vehicle is available.**

**Option:**

05 *Two or more pilot cars may be used to guide two-way traffic through a particularly complex detour.*

### **Section 6C.14 Temporary Traffic Control Signal Method of One-Lane, Two-Way Traffic Control**

**Option:**

01 Traffic control signals may be used to control vehicular traffic movements in one-lane, two-way TTC zones (see Figure 6H-12 and Chapter 4H).

### **Section 6C.15 Stop or Yield Control Method of One-Lane, Two-Way Traffic Control**

**Option:**

01 STOP or YIELD signs may be used to control traffic on low-volume roads at a one-lane, two-way TTC zone when drivers are able to see the other end of the one-lane, two-way operation and have sufficient visibility of approaching vehicles.

**Guidance:**

02 *If the STOP or YIELD sign is installed for only one direction, then the STOP or YIELD sign should face road users who are driving on the side of the roadway that is closed for the work activity area.*

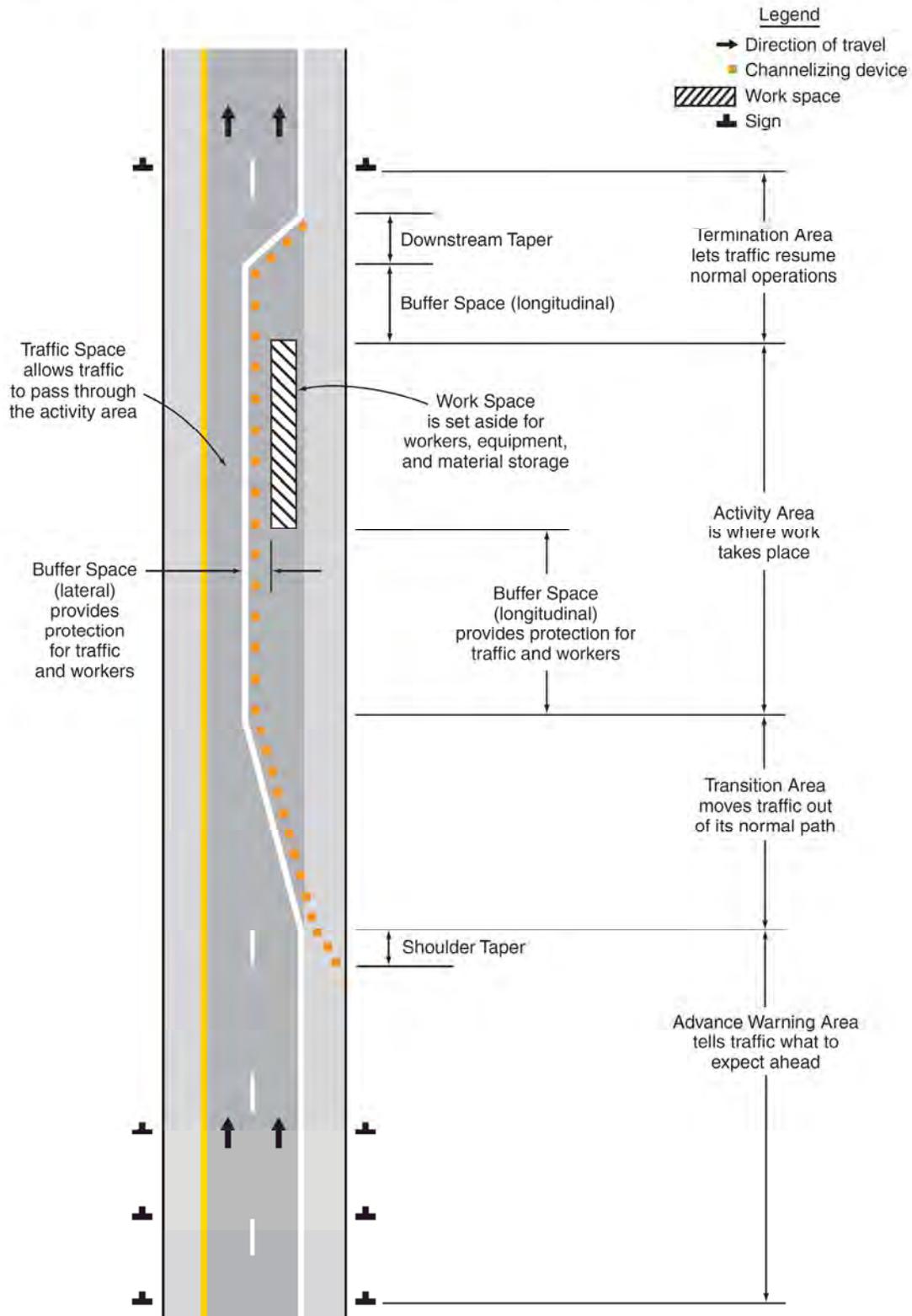
**Standard:**

03 **The approach to the side that is not closed shall be visible (for a distance equal to the safe passing sight distance for that approach) to the driver who must yield or stop.**

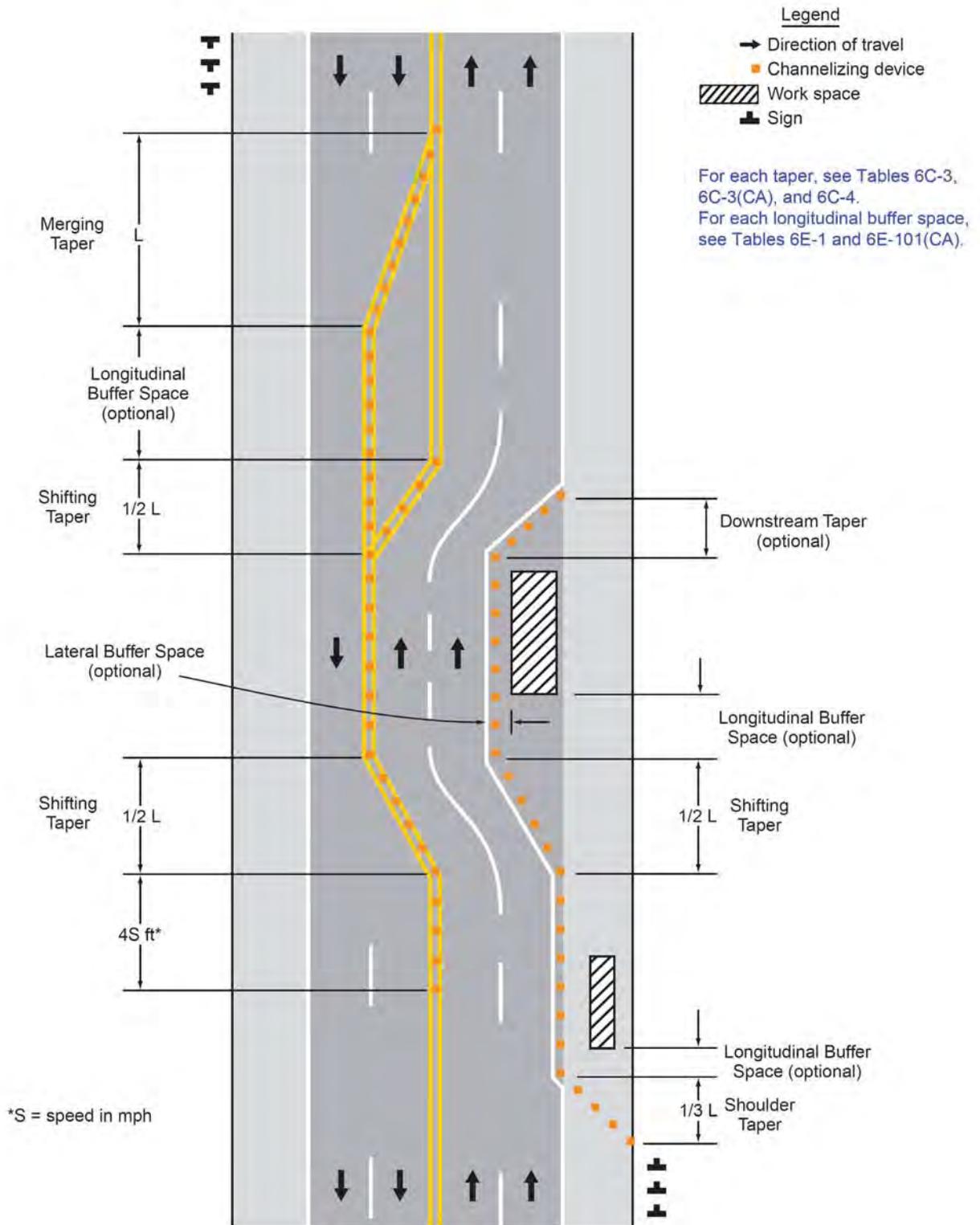
**Support:**

04 *See Section 3B.02 and Figure 6H-11.*

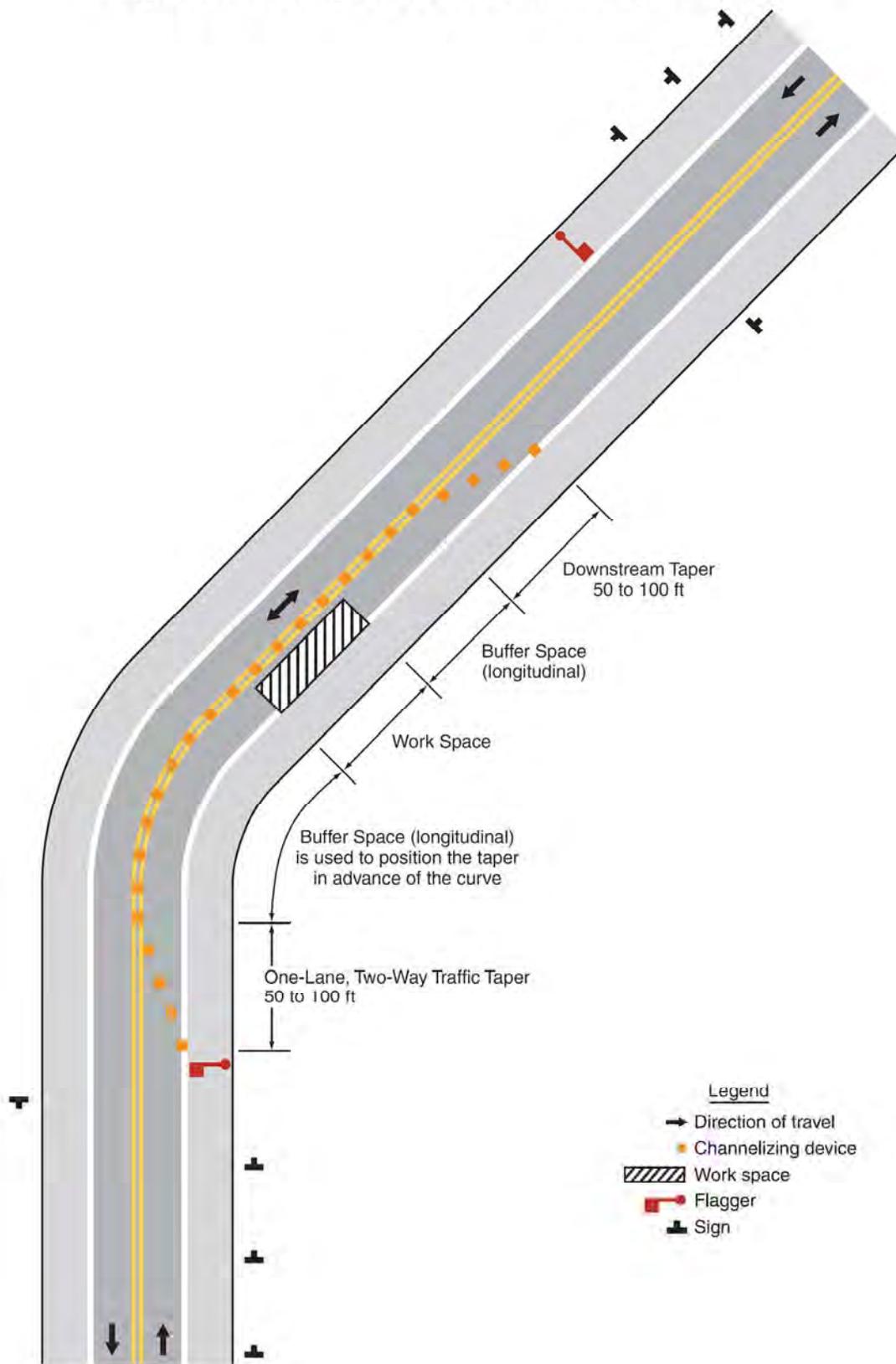
**Figure 6C-1. Component Parts of a Temporary Traffic Control Zone**



**Figure 6C-2. Types of Tapers and Buffer Spaces**



**Figure 6C-3. Example of a One-Lane, Two-Way Traffic Taper**



**Table 6C-1. Recommended Advance Warning Sign Minimum Spacing**

Road Type	Distance Between Signs*		
	A	B	C
Urban (low speed) - 25 mph or less	100 feet	100 feet	100 feet
Urban (high speed) - more than 25 mph to 40 mph	250 feet	250 feet	250 feet
Urban (high speed) - more than 40 mph	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2,640 feet

- \* Speed category to be determined by the highway agency.
- \*\* The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

**Table 6C-2. Stopping Sight Distance as a Function of Speed**

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

- \* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed.  
 Can also be used as Stopping Sight Distance as suggested buffer space length or location for flagger station.

**Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones**

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6C-4 to calculate L

**Table 6C-3(CA). Taper Length Criteria for Temporary Traffic Control Zones  
 (for 12 feet Offset Width)**

Speed* S (mph)	Minimum Taper Length** for Width of Offset 12 feet (W)			
	Merging L (feet)	Shifting L/2 (feet)	Shoulder L/3 (feet)	Down Stream (feet)***
20	80	40	27	50
25	125	63	42	50
30	180	90	60	50
35	245	123	82	50
40	320	160	107	50
45	540	270	180	50
50	600	300	200	50
55	660	330	220	50
60	720	360	240	50
65	780	390	260	50
70	840	420	280	50

\* - Posted speed limit, off-peak 85<sup>th</sup>-percentile speed prior to work starting, or the anticipated operating speed in mph.

\*\* - For other offsets use the following merging taper length formula for L:

For speeds of 40 mph or less,  $L = WS^2/60$

For speeds of 45 mph or more,  $L = WS$

Where:

L = taper length in feet

W = width of offset in feet

S = posted speed limit, off-peak 85<sup>th</sup>-percentile speed prior to work starting, or the anticipated operating speed in mph

\*\*\* - Maximum downstream taper length is 100 feet. See Section 6C.08.

**Table 6C-4. Formulas for Determining  
 Taper Length**

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in feet

W = width of offset in feet

S = posted speed limit, or off-peak 85<sup>th</sup>-percentile speed prior to work starting, or the anticipated operating speed in mph



## CHAPTER 6D. PEDESTRIAN AND WORKER SAFETY

### Section 6D.01 Pedestrian Considerations

#### Support:

<sup>01</sup> A wide range of pedestrians might be affected by TTC zones, including the young, elderly, and people with disabilities such as hearing, visual, or mobility. These pedestrians need a clearly delineated and usable travel path. Considerations for pedestrians with disabilities are addressed in Section 6D.02.

#### Standard:

<sup>02</sup> **The various TTC provisions for pedestrian and worker safety set forth in Part 6 shall be applied by knowledgeable (for example, trained and/or certified) persons after appropriate evaluation and engineering judgment.**

<sup>03</sup> **Advance notification of sidewalk closures shall be provided by the maintaining agency.**

<sup>04</sup> **If the TTC zone affects the movement of pedestrians, adequate pedestrian access and walkways shall be provided. If the TTC zone affects an accessible and detectable pedestrian facility, the accessibility and detectability shall be maintained along the alternate pedestrian route.**

#### Option:

<sup>05</sup> If establishing or maintaining an alternate pedestrian route is not feasible during the project, an alternate means of providing for pedestrians may be used, such as adding free bus service around the project or assigning someone the responsibility to assist pedestrians with disabilities through the project limits.

#### Support:

<sup>06</sup> It must be recognized that pedestrians are reluctant to retrace their steps to a prior intersection for a crossing or to add distance or out-of-the-way travel to a destination.

#### Guidance:

<sup>07</sup> *The following three items should be considered when planning for pedestrians in TTC zones:*

*A. Pedestrians should not be led into conflicts with vehicles, equipment, and operations.*

*B. Pedestrians should not be led into conflicts with vehicles moving through or around the worksite.*

*C. Pedestrians should be provided with a convenient and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s).*

<sup>08</sup> *A pedestrian route should not be severed and/or moved for non-construction activities such as parking for vehicles and equipment.*

<sup>09</sup> *Consideration should be made to separate pedestrian movements from both worksite activity and vehicular traffic. Unless an acceptable route that does not involve crossing the roadway can be provided, pedestrians should be appropriately directed with advance signing that encourages them to cross to the opposite side of the roadway. In urban and suburban areas with high vehicular traffic volumes, these signs should be placed at intersections (rather than midblock locations) so that pedestrians are not confronted with midblock worksites that will induce them to attempt skirting the worksite or making a midblock crossing.*

#### Support:

<sup>10</sup> Figures 6H-28 and 6H-29 show typical TTC device usage and techniques for pedestrian movement through work zones.

#### Guidance:

<sup>11</sup> *To accommodate the needs of pedestrians, including those with disabilities, the following considerations should be addressed when temporary pedestrian pathways in TTC zones are designed or modified:*

*A. Provisions for continuity of accessible paths for pedestrians should be incorporated into the TTC plan.*

*B. Access to transit stops should be maintained.*

*C. A smooth, continuous hard surface should be provided throughout the entire length of the temporary pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be a barrier to wheelchair use. The geometry and alignment of the facility should meet the applicable requirements of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).*

*D. The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the*

*sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60-inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.*

*E. Blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing devices such as audible information devices, accessible pedestrian signals, or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a long cane or who have low vision. Where pedestrian traffic is detoured to a TTC signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals should be considered for crossings along an alternate route.*

*F. When channelization is used to delineate a pedestrian pathway, a continuous detectable edging should be provided throughout the length of the facility such that pedestrians using a long cane can follow it. These detectable edgings should comply with the provisions of Section 6F.74.*

*G. Signs and other devices mounted lower than 7 feet above the temporary pedestrian pathway should not project more than 4 inches into accessible pedestrian facilities.*

**Option:**

<sup>12</sup> Whenever it is feasible, closing off the worksite from pedestrian intrusion may be preferable to channelizing pedestrian traffic along the site with TTC devices.

**Guidance:**

<sup>13</sup> *Fencing should not create sight distance restrictions for road users. Fences should not be constructed of materials that would be hazardous if impacted by vehicles. Wooden railing, fencing, and similar systems placed immediately adjacent to motor vehicle traffic should not be used as substitutes for crashworthy temporary traffic barriers.*

<sup>14</sup> *Ballast for TTC devices should be kept to the minimum amount needed and should be mounted low to prevent penetration of the vehicle windshield.*

<sup>15</sup> *Movement by work vehicles and equipment across designated pedestrian paths should be minimized and, when necessary, should be controlled by flaggers or TTC. Staging or stopping of work vehicles or equipment along the side of pedestrian paths should be avoided, since it encourages movement of workers, equipment, and materials across the pedestrian path.*

<sup>16</sup> *Access to the work space by workers and equipment across pedestrian walkways should be minimized because the access often creates unacceptable changes in grade, and rough or muddy terrain, and pedestrians will tend to avoid these areas by attempting non-intersection crossings where no curb ramps are available.*

**Option:**

<sup>17</sup> A canopied walkway may be used to protect pedestrians from falling debris, and to provide a covered passage for pedestrians.

**Guidance:**

<sup>18</sup> *Covered walkways should be sturdily constructed and adequately lighted for nighttime use.*

<sup>19</sup> *When pedestrian and vehicle paths are rerouted to a closer proximity to each other, consideration should be given to separating them by a temporary traffic barrier.*

<sup>20</sup> *If a temporary traffic barrier is used to shield pedestrians, it should be designed to accommodate site conditions.*

**Support:**

<sup>21</sup> Depending on the possible vehicular speed and angle of impact, temporary traffic barriers might deflect upon impact by an errant vehicle. Guidance for locating and designing temporary traffic barriers can be found in Chapter 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11).

**Standard:**

<sup>22</sup> **Short intermittent segments of temporary traffic barrier shall not be used because they nullify the containment and redirective capabilities of the temporary traffic barrier, increase the potential for serious injury both to vehicle occupants and pedestrians, and encourage the presence of blunt, leading ends. All upstream leading ends that are present shall be appropriately flared or protected with properly installed and maintained crashworthy cushions. Adjacent temporary traffic barrier segments shall be properly connected in order to provide the overall strength required for the temporary traffic barrier to perform properly.**

**23 Normal vertical curbing shall not be used as a substitute for temporary traffic barriers when temporary traffic barriers are needed.**

**Option:**

24 Temporary traffic barriers or longitudinal channelizing devices may be used to discourage pedestrians from unauthorized movements into the work space. They may also be used to inhibit conflicts with vehicular traffic by minimizing the possibility of midblock crossings.

**Support:**

25 A major concern for pedestrians is urban and suburban building construction encroaching onto the contiguous sidewalks, which forces pedestrians off the curb into direct conflict with moving vehicles.

**Guidance:**

26 *If a significant potential exists for vehicle incursions into the pedestrian path, pedestrians should be rerouted or temporary traffic barriers should be installed.*

**Support:**

27 TTC devices, jersey barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.

**Guidance:**

28 *Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11), and should not be used as a control for pedestrian movements.*

29 *In general, pedestrian routes should be preserved in urban and commercial suburban areas. Alternative routing should be discouraged.*

30 *The highway agency in charge of the TTC zone should regularly inspect the activity area so that effective pedestrian TTC is maintained.*

**Support:**

31 Other laws and requirements are unique to California and need to be followed when providing pedestrian access through or around TTC zones.

32 Additional information on this topic can be found in publication titled "Pedestrian Considerations for California Temporary Traffic Control Zones on the Department's following web link:

<http://dot.ca.gov/hq/traffops/signtech/signdel/pdf/PedBrochure.pdf>

## **Section 6D.02 Accessibility Considerations**

**Support:**

01 Additional information on the design and construction of accessible temporary facilities is found in publications listed in Section 1A.11 (see Publications 12, 38, 39, and 42).

**Guidance:**

02 *The extent of pedestrian needs should be determined through engineering judgment or by the individual responsible for each TTC zone situation. Adequate provisions should be made for pedestrians with disabilities.*

**Standard:**

03 **When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. Where pedestrians with visual disabilities normally use the closed sidewalk, a barrier that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.**

**Support:**

04 Maintaining a detectable, channelized pedestrian route is much more useful to pedestrians who have visual disabilities than closing a walkway and providing audible directions to an alternate route involving additional crossings and a return to the original route. Braille is not useful in conveying such information because it is difficult to find. Audible instructions might be provided, but the extra distance and additional street crossings might add complexity to a trip.

**Guidance:**

05 *Because printed signs and surface delineation are not usable by pedestrians with visual disabilities, blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual*

*disabilities by providing audible information devices, accessible pedestrian signals, and barriers and channelizing devices that are detectable to pedestrians traveling with the aid of a long cane or who have low vision.*

Support:

<sup>06</sup> The most desirable way to provide information to pedestrians with visual disabilities that is equivalent to visual signing for notification of sidewalk closures is a speech message provided by an audible information device. Devices that provide speech messages in response to passive pedestrian actuation are the most desirable. Other devices that continuously emit a message, or that emit a message in response to use of a pushbutton, are also acceptable. signing information can also be transmitted to personal receivers, but currently such receivers are not likely to be carried or used by pedestrians with visual disabilities in TTC zones. Audible information devices might not be needed if detectable channelizing devices make an alternate route of travel evident to pedestrians with visual disabilities.

Guidance:

<sup>07</sup> *If a pushbutton is used to provide equivalent TTC information to pedestrians with visual disabilities, the pushbutton should be equipped with a locator tone to notify pedestrians with visual disabilities that a special accommodation is available, and to help them locate the pushbutton.*

### **Section 6D.03 Worker Safety Considerations**

Support:

<sup>01</sup> Equally as important as the safety of road users traveling through the TTC zone is the safety of workers. TTC zones present temporary and constantly changing conditions that are unexpected by the road user. This creates an even higher degree of vulnerability for workers on or near the roadway.

<sup>02</sup> Maintaining TTC zones with road user flow inhibited as little as possible, and using TTC devices that get the road user's attention and provide positive direction are of particular importance. Likewise, equipment and vehicles moving within the activity area create a risk to workers on foot. When possible, the separation of moving equipment and construction vehicles from workers on foot provides the operator of these vehicles with a greater separation clearance and improved sight lines to minimize exposure to the hazards of moving vehicles and equipment.

Guidance:

<sup>03</sup> *The following are the key elements of worker safety and TTC management that should be considered to improve worker safety:*

- A. Training—all workers should be trained on how to work next to motor vehicle traffic in a way that minimizes their vulnerability. Workers having specific TTC responsibilities should be trained in TTC techniques, device usage, and placement.*
- B. Temporary Traffic Barriers—temporary traffic barriers should be placed along the work space depending on factors such as lateral clearance of workers from adjacent traffic, speed of traffic, duration and type of operations, time of day, and volume of traffic.*
- C. Speed Reduction—reducing the speed of vehicular traffic, mainly through regulatory speed zoning, funneling, lane reduction, or the use of uniformed law enforcement officers or flaggers, should be considered. **The use of regulatory speed zone signing tends to be more effective when law enforcement is present.***
- D. Activity Area—planning the internal work activity area to minimize backing-up maneuvers of construction vehicles should be considered to minimize the exposure to risk.*
- E. Worker Safety Planning—a trained person designated by the employer should conduct a basic hazard assessment for the worksite and job classifications required in the activity area. This safety professional should determine whether engineering, administrative, or personal protection measures should be implemented. This plan should be in accordance with the Occupational Safety and Health Act of 1970, as amended, "General Duty Clause" Section 5(a)(1) - Public Law 91-596, 84 Stat. 1590, December 29, 1970, as amended, and with the requirement to assess worker risk exposures for each job site and job classification, as per 29 CFR 1926.20 (b)(2) of "Occupational Safety and Health Administration Regulations, General Safety and Health Provisions" (see Section 1A.11).*

**Standard:**

**<sup>04</sup> All workers, including emergency responders, within the right-of-way who are exposed either to traffic (vehicles using the highway for purposes of travel) or to work vehicles and construction equipment within the TTC zone shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2004 publication entitled “American National Standard for High-Visibility Safety Apparel and Headwear” (see Section 1A.11), or equivalent revisions, and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure, except as provided in Paragraph 5. A person designated by the employer to be responsible for worker safety shall make the selection of the appropriate class of garment.**

<sup>04a</sup> Refer to Construction Safety Order in the California Code of Regulations (Title 8, Division 1, Chapter 4, Subchapter 4, Article 11, Section 1598 and 1599). See Section 1A.11 for information regarding this publication.

**Option:**

<sup>05</sup> Emergency and incident responders and law enforcement personnel within the TTC zone may wear high-visibility safety apparel that meets the performance requirements of the ANSI/ISEA 207-2006 publication entitled “American National Standard for High-Visibility Public Safety Vests” (see Section 1A.11), or equivalent revisions, and labeled as ANSI 207-2006, in lieu of ANSI/ISEA 107-2004 apparel.

**Standard:**

**<sup>06</sup> When uniformed law enforcement personnel are used to direct traffic, to investigate crashes, or to handle lane closures, obstructed roadways, and disasters, high-visibility safety apparel as described in this Section shall be worn by the law enforcement personnel.**

**<sup>07</sup> Except as provided in Paragraph 8, firefighters or other emergency responders working within the right-of-way shall wear high-visibility safety apparel as described in this Section.**

**Option:**

<sup>08</sup> Firefighters or other emergency responders working within the right-of-way and engaged in emergency operations that directly expose them to flame, fire, heat, and/or hazardous materials may wear retroreflective turnout gear that is specified and regulated by other organizations, such as the National Fire Protection Association.

<sup>09</sup> The following are additional elements of TTC management that may be considered to improve worker safety:

- A. Shadow Vehicle—in the case of mobile and constantly moving operations, such as pothole patching and striping operations, a shadow vehicle, equipped with appropriate lights and warning signs, may be used to protect the workers from impacts by errant vehicles. The shadow vehicle may be equipped with a rear-mounted impact attenuator.
- B. Road Closure—if alternate routes are available to handle road users, the road may be closed temporarily. This may also facilitate project completion and thus further reduce worker vulnerability.
- C. Law Enforcement Use—in highly vulnerable work situations, particularly those of relatively short duration, law enforcement units may be stationed to heighten the awareness of passing vehicular traffic and to improve safety through the TTC zone.
- D. Lighting—for nighttime work, the TTC zone and approaches may be lighted.

**Guidance:**

*Care should be taken to ensure that the lighting used for nighttime work does not cause blinding. Refer to CVC 21466.5 for light impairing driver's vision.*

**Support:**

For construction lighting Refer to Construction Safety Order in the California Code of Regulations (Title 8, Division 1, Chapter 4, Subchapter 4, Article 3, Section 1523 - Illumination). See Section 1A.11 for information regarding this publication.

**Option:**

- E. Special Devices—these include rumble strips, changeable message signs, hazard identification beacons, flags, and warning lights. Intrusion warning devices may be used to alert workers to the approach of errant vehicles.

**Support:**

- F. Public Information – Well informed public plays an important role in worker safety. See Section 6B.01 for details.

**Support:**

<sup>10</sup> Judicious use of the special devices described in Item E in Paragraph 9 might be helpful for certain difficult TTC situations, but misuse or overuse of special devices or techniques might lessen their effectiveness.

**Section 6D.101(CA) Bicycle Considerations**

**Support:**

<sup>01</sup> There are several considerations in planning for bicyclists in TTC zones on highways and streets:

- A. A travel route that replicates the most desirable characteristics of a wide paved shoulder or bikeway through or around the TTC zone is desirable for bicyclists.
- B. If the TTC zone interrupts the continuity of an existing bikeway system, signs directing bicyclists through or around the zone and back to the bikeway is desirable.
- C. Unless a separate bike path through or around the TTC zone is provided, adequate roadway lane width to allow bicyclists and motor vehicles to travel side by side through or around the TTC zone is desirable.

**Guidance:**

- D. *When the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, warning signs should be used to advise motorists of the presence of bicyclists in the travel way lanes. See Section 6G.05 for more details.*

**Standard:**

- E. **Bicyclists shall not be led into direct conflicts with mainline traffic, work site vehicles, or equipment moving through or around the TTC zone.**

**Support:**

<sup>02</sup> Figures 6H-15, 6H-30, 6H-32(CA), 6H-36(CA), 6H-101(CA), 6H-102(CA), 6H-103(CA), and 6H-104(CA) show typical TTC device usage and techniques for bicycle movement through TTC zones.

## CHAPTER 6E. FLAGGER CONTROL

### Section 6E.01 Qualifications for Flaggers

*Guidance:*

<sup>01</sup> Because flaggers are responsible for public safety and make the greatest number of contacts with the public of all highway workers, they should be trained in safe traffic control practices and public contact techniques.

Flaggers should be able to satisfactorily demonstrate the following abilities:

- A. Ability to receive and communicate specific instructions clearly, firmly, and courteously;
- B. Ability to move and maneuver quickly in order to avoid danger from errant vehicles;
- C. Ability to control signaling devices (such as paddles and flags) in order to provide clear and positive guidance to drivers approaching a TTC zone in frequently changing situations;
- D. Ability to understand and apply safe traffic control practices, sometimes in stressful or emergency situations; and
- E. Ability to recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.

**Standard:**

<sup>02</sup> Flaggers shall be trained in the proper fundamentals of flagging moving traffic before being assigned as flaggers. Signaling directions used by flaggers shall conform to Figure 6E-3. The training and instructions shall be based on this Manual and work site conditions and also include the following:

- (1) flagger equipment which must be used,
- (2) layout of the work zone and flagging station,
- (3) methods to signal traffic to stop, proceed or slow down,
- (4) methods of one-way traffic control,
- (5) trainee demonstration of proper flagging methodology and operations,
- (6) emergency vehicles traveling through the work zone,
- (7) handling emergency situations,
- (8) methods of dealing with hostile drivers,
- (9) flagging procedures when a single flagger is used (when applicable),

<sup>03</sup> Documentation of the training shall be maintained as required by Injury Illness and Prevention Program of the General Industry Safety Order in the California Code of Regulations (Title 8, Division 1, Chapter 4, Subchapter 7, Section 3203).

<sup>04</sup> Flaggers shall be trained by persons with the qualifications and experience necessary to effectively instruct the employee in the proper fundamentals of flagging moving traffic.

**Support:**

<sup>05</sup> Refer to Construction Safety Order in the California Code of Regulations (Title 8, Division 1, Chapter 4, Subchapter 4, Article 11, Section 1599 - Flaggers) for flagger training. See Section 1A.11 for information regarding this publication.

### Section 6E.02 High-Visibility Safety Apparel

**Standard:**

<sup>01</sup> For daytime and nighttime activity, flaggers shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107–2004 publication entitled “American National Standard for High-Visibility Apparel and Headwear” (see Section 1A.11) and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. The apparel background (outer) material color shall be fluorescent orange-red, fluorescent yellow-green, or a combination of the two as defined in the ANSI standard. The retroreflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 1,000 feet. The retroreflective safety apparel shall be designed to clearly identify the wearer as a person.

*Guidance:*

<sup>02</sup> For nighttime activity, high-visibility safety apparel that meets the Performance Class 3 requirements of the ANSI/ISEA 107–2004 publication entitled “American National Standard for High-Visibility Apparel and Headwear” (see Section 1A.11) and labeled as meeting the ANSI 107-2004 standard performance for Class 3 risk exposure should be considered for flagger wear.

**Standard:**

**03 When uniformed law enforcement officers are used to direct traffic within a TTC zone, they shall wear high-visibility safety apparel as described in this Section.**

**Option:**

04 In lieu of ANSI/ISEA 107-2004 apparel, law enforcement personnel within the TTC zone may wear high-visibility safety apparel that meets the performance requirements of the ANSI/ISEA 207-2006 publication entitled "American National Standard for High-Visibility Public Safety Vests" (see Section 1A.11) and labeled as ANSI 207-2006.

**Section 6E.03 Hand-Signaling Devices**

*Guidance:*

**Standard:**

**01 The STOP/SLOW (C28A(CA)/C28B(CA)) paddle ~~should~~ shall be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags. Use of flags ~~should~~ shall be limited to emergency situations.**

**Standard:**

**02 The STOP/SLOW paddle shall have an octagonal shape on a rigid handle. STOP/SLOW paddles shall be at least 18 inches wide with letters at least 6 inches high. The STOP (R1-1) face shall have white letters and a white border on a red or fluorescent red background. The SLOW (W20-8) face shall have black letters and a black border on an orange or fluorescent orange background. When used at night, the STOP/SLOW paddle shall be retroreflectORIZED.**

**02a The sign retroreflectivity shall be maintained at or above the minimum levels in Table 2A-3.**

*Guidance:*

*03 The STOP/SLOW paddle should be fabricated from light semi-rigid material. The bottom of the STOP/SLOW sign portion of the paddle should be a minimum of 6 feet above the pavement when mounted on a rigid staff.*

**Support:**

04 The optimum method of displaying a STOP or SLOW message is to place the STOP/SLOW paddle on a rigid staff that is tall enough that when the end of the staff is resting on the ground, the message is high enough to be seen by approaching or stopped traffic.

**Option:**

**04a The 24 x 24 inch size of the STOP/SLOW paddle may be used where greater emphasis is needed and speeds are 30 mph or more.**

05 The STOP/SLOW paddle may be modified to improve conspicuity by incorporating ~~either white or~~ red flashing lights on the STOP face, and ~~either white or~~ yellow flashing lights on the SLOW face. The flashing lights may be arranged in any of the following patterns:

- A. Two ~~white or~~ red lights, one centered vertically above and one centered vertically below the STOP legend; and/or two ~~white or~~ yellow lights, one centered vertically above and one centered vertically below the SLOW legend;
- B. Two ~~white or~~ red lights, one centered horizontally on each side of the STOP legend; and/or two ~~white or~~ yellow lights, one centered horizontally on each side of the SLOW legend;
- C. One ~~white or~~ red light centered below the STOP legend; and/or one ~~white or~~ yellow light centered below the SLOW legend;
- D. A series of eight or more small ~~white or~~ red lights no larger than 1/4 inch in diameter along the outer edge of the paddle, arranged in an octagonal pattern at the eight corners of the border of the STOP face; and/ or a series of eight or more small ~~white or~~ yellow lights no larger than 1/4 inch in diameter along the outer edge of the paddle, arranged in a diamond pattern along the border of the SLOW face; or
- E. A series of white lights forming the shapes of the letters in the legend.

**Standard:**

**06 If flashing lights are used on the STOP face of the paddle, their colors shall be ~~all white or~~ all red. If flashing lights are used on the SLOW face of the paddle, their colors shall be ~~all white or~~ all yellow.**

**07 If more than eight flashing lights are used, the lights shall be arranged such that they clearly convey the octagonal shape of the STOP face of the paddle and/or the diamond shape of the SLOW face of the paddle.**

**08 If flashing lights are used on the STOP/SLOW paddle, the flash rate shall be at least 50, but not more than 60, flashes per minute.**

**09 Flags, when used (for emergency situations only), shall be red or fluorescent orange/red in color, shall be a minimum of 24 inches square, and shall be securely fastened to a staff that is approximately 36 inches in length.**

*Guidance:*

*10 The free edge of a flag should be weighted so the flag will hang vertically, even in heavy winds.*

**Standard:**

**11 When used at nighttime (for emergency situations only), flags shall be retroreflectorized red.**

*Option:*

**12 When flagging in an emergency situation at night in a non-illuminated flagger station, a flagger may use a traffic baton made of a flashlight with a red glow cone to supplement the STOP/SLOW paddle or flag.**

**Standard:**

**13 When a flashlight is used for flagging in an emergency situation at night in a non-illuminated flagger station, the flagger shall hold the flashlight in the left hand, shall hold the paddle or flag in the right hand as shown in Figure 6E-3, and shall use the flashlight in the following manner to control approaching road users:**

- A. To inform road users to stop, the flagger shall hold the flashlight with the left arm extended and pointed down toward the ground, and then shall slowly wave the flashlight in front of the body in a slow arc from left to right such that the arc reaches no farther than 45 degrees from vertical.**
- B. To inform road users to proceed, the flagger shall point the flashlight at the vehicle's bumper, slowly aim the flashlight toward the open lane, then hold the flashlight in that position. The flagger shall not wave the flashlight.**
- C. To alert or slow traffic, the flagger shall point the flashlight toward oncoming traffic and quickly wave the flashlight in a figure eight motion.**

## **Section 6E.04 Automated Flagger Assistance Devices**

*Support:*

**01 Automated Flagger Assistance Devices (AFADs) enable a flagger(s) to be positioned out of the lane of traffic and are used to control road users through temporary traffic control zones. These devices are designed to be remotely operated either by a single flagger at one end of the TTC zone or at a central location, or by separate flaggers near each device's location.**

**02 There are two types of AFADs:**

- A. An AFAD (see Section 6E.05) that uses a remotely controlled STOP/SLOW sign on either a trailer or a movable cart system to alternately control right-of-way.**
- B. An AFAD (see Section 6E.06) that uses remotely controlled red and yellow lenses and a gate arm to alternately control right-of-way.**

**03 AFADs might be appropriate for short-term and intermediate-term activities (see Section 6G.02). Typical applications include TTC activities such as, but not limited to:**

- A. Bridge maintenance;**
- B. Haul road crossings; and**
- C. Pavement patching.**

**Standard:**

**04 AFADs shall only be used in situations where there is only one lane of approaching traffic in the direction to be controlled.**

**05 When used at night, the AFAD location shall be illuminated in accordance with Section 6E.08.**

*Guidance:*

*06 AFADs should not be used for long-term stationary work (see Section 6G.02).*

**Standard:**

- 07 Because AFADs are not traffic control signals, they shall not be used as a substitute for or a replacement for a continuously operating temporary traffic control signal as described in Section 6F.84.**
- 08 AFADs shall meet the crashworthy performance criteria contained in Section 6F.01.**

*Guidance:*

*09 If used, AFADs should be located in advance of one-lane, two-way tapers and downstream from the point where approaching traffic is to stop in response to the device.*

**Standard:**

**10 If used, AFADs shall be placed so that all of the signs and other items controlling traffic movement are readily visible to the driver of the initial approaching vehicle with advance warning signs alerting other approaching traffic to be prepared to stop.**

**11 If used, an AFAD shall be operated only by a flagger (see Section 6E.01) who has been trained on the operation of the AFAD. The flagger(s) operating the AFAD(s) shall not leave the AFAD(s) unattended at any time while the AFAD(s) is being used.**

**12 The use of AFADs shall conform to one of the following methods:**

- A. An AFAD at each end of the TTC zone (Method 1), or**
- B. An AFAD at one end of the TTC zone and a flagger at the opposite end (Method 2).**

**13 Except as provided in Paragraph 14, two flaggers shall be used when using either Method 1 or Method 2.**

*Option:*

**14 A single flagger may simultaneously operate two AFADs (Method 1) or may operate a single AFAD on one end of the TTC zone while being the flagger at the opposite end of the TTC zone (Method 2) if both of the following conditions are present:**

- A. The flagger has an unobstructed view of the AFAD(s), and**
- B. The flagger has an unobstructed view of approaching traffic in both directions.**

*Guidance:*

*15 When an AFAD is used, the advance warning signing should include a ROAD WORK AHEAD (W20-1) sign, a ONE LANE ROAD (W20-4) sign, and a BE PREPARED TO STOP (W3-4) sign.*

**Standard:**

**16 When the AFAD is not in use, the signs associated with the AFAD, both at the AFAD location and in advance, shall be removed or covered.**

*Guidance:*

*17 A State or local agency that elects to use AFADs should adopt a policy, based on engineering judgment, governing AFAD applications. The policy should also consider more detailed and/or more restrictive requirements for AFAD use, such as the following:*

- A. Conditions applicable for the use of Method 1 and Method 2 AFAD operation,*
- B. Volume criteria,*
- C. Maximum distance between AFADs,*
- D. Conflicting lenses/indications monitoring requirements,*
- E. Fail safe procedures,*
- F. Additional signing and pavement markings,*
- G. Application consistency,*
- H. Larger signs or lenses to increase visibility, and*
- I. Use of backplates.*

**Section 6E.05 STOP/SLOW Automated Flagger Assistance Devices**

**Standard:**

**01 A STOP/SLOW Automated Flagger Assistance Device (AFAD) (see Section 6E.04) shall include a STOP/SLOW sign that alternately displays the STOP (R1-1) face and the SLOW (W20-8) face of a STOP/SLOW paddle (see Figure 6E-1).**

**02 The AFAD's STOP/SLOW sign shall have an octagonal shape, shall be fabricated of rigid material, and shall be mounted with the bottom of the sign a minimum of 6 feet above the pavement on an**

**appropriate support. The size of the STOP/SLOW sign shall be at least 24 x 24 inches with letters at least 8 inches high. The background of the STOP face shall be red with white letters and border. The background of the SLOW face shall be diamond shaped and orange with black letters and border. Both faces of the STOP/SLOW sign shall be retroreflectorized.**

**03 The AFAD's STOP/SLOW sign shall have a means to positively lock, engage, or otherwise maintain the sign assembly in a stable condition when set in the STOP or SLOW position.**

**04 The AFAD's STOP/SLOW sign shall be supplemented with active conspicuity devices by incorporating either:**

**A. ~~White or~~ red flashing lights within the STOP face and ~~white or~~ yellow flashing lights within the SLOW face meeting the provisions contained in Section 6E.03; or**

**B. A Stop Beacon (see Section 4L.05) mounted a maximum of 24 inches above the STOP face and a Warning Beacon (see Section 4L.03) mounted a maximum of 24 inches above, below, or to the side of the SLOW face. The Stop Beacon shall not be flashed or illuminated when the SLOW face is displayed, and the Warning Beacon shall not be flashed or illuminated when the STOP face is displayed. Except for the mounting locations, the beacons shall comply with the provisions of Chapter 4L.**

Option:

**05 Type B warning light(s) (see Section 6F.83) may be used in lieu of the Warning Beacon during the display of the SLOW face of the AFAD's STOP/SLOW sign.**

**Standard:**

**06 If Type B warning lights are used in lieu of a Warning Beacon, they shall flash continuously when the SLOW face is displayed and shall not be flashed or illuminated when the STOP face is displayed.**

Option:

**07 The faces of the AFAD's STOP/SLOW sign may include louvers to improve the stability of the device in windy or other adverse environmental conditions.**

**Standard:**

**08 If louvers are used, the louvers shall be designed such that the full sign face is visible to approaching traffic at a distance of 50 feet or greater.**

*Guidance:*

*09 The STOP/SLOW AFAD should include a gate arm that descends to a down position across the approach lane of traffic when the STOP face is displayed and then ascends to an upright position when the SLOW face is displayed.*

Option:

**10 In lieu of a stationary STOP/SLOW sign with a separate gate arm, the STOP/SLOW sign may be attached to a mast arm that physically blocks the approach lane of traffic when the STOP face is displayed and then moves to a position that does not block the approach lane when the SLOW face is displayed.**

**Standard:**

**11 Gate arms, if used, shall be fully retroreflectorized on both sides, and shall have vertical alternating red and white stripes at 16-inch intervals measured horizontally as shown in Figure 8C-1. When the arm is in the down position blocking the approach lane:**

**A. The minimum vertical aspect of the arm and sheeting shall be 2 inches; and**

**B. The end of the arm shall reach at least to the center of the lane being controlled.**

**12 A WAIT ON STOP (R1-7) sign (see Figure 6E-1) shall be displayed to road users approaching the AFAD.**

Option:

**13 A GO ON SLOW (R1-8) sign (see Figure 6E-1) may also be displayed to road users approaching the AFAD.**

**Standard:**

**14 The GO ON SLOW sign, if used, and the WAIT ON STOP sign shall be positioned on the same support structure as the AFAD or immediately adjacent to the AFAD such that they are in the same direct line of view of approaching traffic as the sign faces of the AFAD. Both signs shall have black legends and borders on white backgrounds. Each of these signs shall be rectangular in shape and each shall be at least 24 x 30 inches in size with letters at least 6 inches high.**

**15 To inform road users to stop, the AFAD shall display the STOP face and the red ~~or white~~ lights, if used, within the STOP face shall flash or the Stop Beacon shall flash. To inform road users to proceed, the**

AFAD shall display the SLOW face and the yellow ~~or white~~ lights, if used, within the SLOW face shall flash or the Warning Beacon or the Type B warning lights shall flash.

16 If STOP/SLOW AFADs are used to control traffic in a one-lane, two-way TTC zone, safeguards shall be incorporated to prevent the flagger(s) from simultaneously displaying the SLOW face at each end of the TTC zone. Additionally, the flagger(s) shall not display the AFAD's SLOW face until all oncoming vehicles have cleared the one-lane portion of the TTC zone.

## Section 6E.06 Red/Yellow Lens Automated Flagger Assistance Devices

### Standard:

01 A Red/Yellow Lens Automated Flagger Assistance Device (AFAD) (see Section 6E.04) shall alternately display a steadily illuminated CIRCULAR RED lens and a flashing CIRCULAR YELLOW lens to control traffic without the need for a flagger in the immediate vicinity of the AFAD or on the roadway (see Figure 6E-2).

02 Red/Yellow Lens AFADs shall have at least one set of CIRCULAR RED and CIRCULAR YELLOW lenses that are 12 inches in diameter. Unless otherwise provided in this Section, the lenses and their arrangement, CIRCULAR RED on top and CIRCULAR YELLOW below, shall comply with the applicable provisions for traffic signal indications in Part 4. If the set of lenses is post-mounted, the bottom of the housing (including brackets) shall be at least 7 feet above the pavement. If the set of lenses is located over any portion of the highway that can be used by motor vehicles, the bottom of the housing (including brackets) shall be at least 15 feet above the pavement.

### Option:

03 Additional sets of CIRCULAR RED and CIRCULAR YELLOW lenses, located over the roadway or on the left-hand side of the approach and operated in unison with the primary set, may be used to improve visibility and/or conspicuity of the AFAD.

### Standard:

04 A Red/Yellow Lens AFAD shall include a gate arm that descends to a down position across the approach lane of traffic when the steady CIRCULAR RED lens is illuminated and then ascends to an upright position when the flashing CIRCULAR YELLOW lens is illuminated. The gate arm shall be fully retroreflectorized on both sides, and shall have vertical alternating red and white stripes at 16-inch intervals measured horizontally as shown in Figure 8C-1. When the arm is in the down position blocking the approach lane:

- A. The minimum vertical aspect of the arm and sheeting shall be 2 inches; and
- B. The end of the arm shall reach at least to the center of the lane being controlled.

05 A Stop Here On Red (R10-6 ~~or R10-6a~~) sign (see Section 2B.53) shall be installed on the right-hand side of the approach at the point at which drivers are expected to stop when the steady CIRCULAR RED lens is illuminated (see Figure 6E-2).

06 To inform road users to stop, the AFAD shall display a steadily illuminated CIRCULAR RED lens and the gate arm shall be in the down position. To inform road users to proceed, the AFAD shall display a flashing CIRCULAR YELLOW lens and the gate arm shall be in the upright position.

07 If Red/Yellow Lens AFADs are used to control traffic in a one-lane, two-way TTC zone, safeguards shall be incorporated to prevent the flagger(s) from actuating a simultaneous display of a flashing CIRCULAR YELLOW lens at each end of the TTC zone. Additionally, the flagger shall not actuate the AFAD's display of the flashing CIRCULAR YELLOW lens until all oncoming vehicles have cleared the one-lane portion of the TTC zone.

08 A change interval shall be provided as the transition between the display of the flashing CIRCULAR YELLOW indication and the display of the steady CIRCULAR RED indication. During the change interval, the CIRCULAR YELLOW lens shall be steadily illuminated. The gate arm shall remain in the upright position during the display of the steadily illuminated CIRCULAR YELLOW change interval.

09 A change interval shall not be provided between the display of the steady CIRCULAR RED indication and the display of the flashing CIRCULAR YELLOW indication.

*Guidance:*

*<sup>10</sup> The steadily illuminated CIRCULAR YELLOW change interval should have a duration of at least 5 seconds, unless a different duration, within the range of durations recommended by Section 4D.26, is justified by engineering judgment.*

### **Section 6E.07 Flagger Procedures**

**Support:**

<sup>01</sup> The use of paddles and flags by flaggers is illustrated in Figure 6E-3.

**Standard:**

<sup>02</sup> **Flaggers shall use a STOP/SLOW paddle, a flag (for emergency situations only), or an Automated Flagger Assistance Device (AFAD) to control road users approaching a TTC zone. The use of hand movements alone without a paddle, flag, or AFAD to control road users shall be prohibited except for law enforcement personnel or emergency responders at incident scenes as described in Section 6I.01.**

<sup>03</sup> **The following methods of signaling with paddles shall be used:**

- A. To stop road users, the flagger shall face road users and aim the STOP paddle face toward road users in a stationary position with the arm extended horizontally away from the body. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.**
- B. To direct stopped road users to proceed, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body. The flagger shall motion with the free hand for road users to proceed.**
- C. To alert or slow traffic, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body.**

**Option:**

<sup>04</sup> To further alert or slow traffic, the flagger holding the SLOW paddle face toward road users may motion up and down with the free hand, palm down.

**Standard:**

<sup>05</sup> **The following methods of signaling with a flag (for emergency situations only) shall be used:**

- A. To stop road users, the flagger shall face road users and extend the flag staff horizontally across the road users' lane in a stationary position so that the full area of the flag is visibly hanging below the staff. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.**
- B. To direct stopped road users to proceed, the flagger shall face road users with the flag and arm lowered from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.**
- C. To alert or slow traffic, the flagger shall face road users and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down without raising the arm above a horizontal position. The flagger shall keep the free hand down.**

*Guidance:*

*<sup>06</sup> The flagger should stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users. A flagger should only stand in the lane being used by moving road users after road users have stopped. The flagger should be clearly visible to the first approaching road user at all times. The flagger also should be visible to other road users. The flagger should be stationed sufficiently in advance of the workers to warn them (for example, with audible warning devices such as horns or whistles) of approaching danger by out-of-control vehicles. The flagger should stand alone, away from other workers, work vehicles, or equipment.*

**Option:**

<sup>07</sup> At spot lane closures where adequate sight distance is available for the reasonably safe handling of traffic, the use of one flagger may be sufficient.

*Guidance:*

*<sup>08</sup> When a single flagger is used, the flagger should be stationed on the shoulder opposite the spot lane closure or work space, or in a position where good visibility and traffic control can be maintained at all times.*

## **Section 6E.08 Flagger Stations**

### **Standard:**

**01 Flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point.**

### **Option:**

02 The distances shown in Table 6E-1, which provides information regarding the stopping sight distance as a function of speed, may be used for the location of a flagger station. These distances may be increased for downgrades ([Table 6E-101\(CA\)](#)) and other conditions that affect stopping distance.

### **Guidance:**

03 *Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space. The flagger should identify an escape route that can be used to avoid being struck by an errant vehicle.*

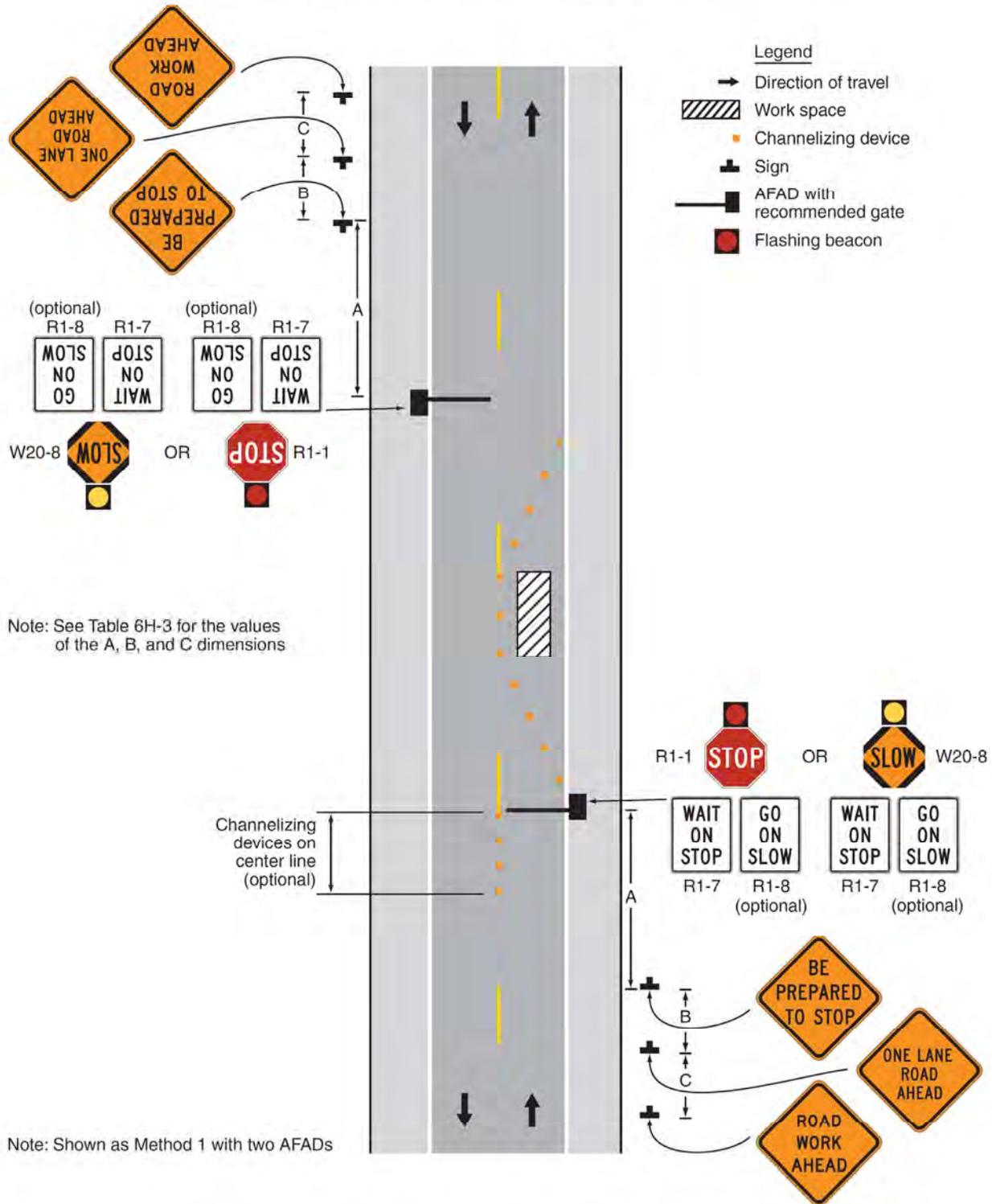
### **Standard:**

**04 Except in emergency situations, flagger stations shall be preceded by an advance warning sign or signs. Except in emergency situations, flagger stations shall be illuminated at night.**

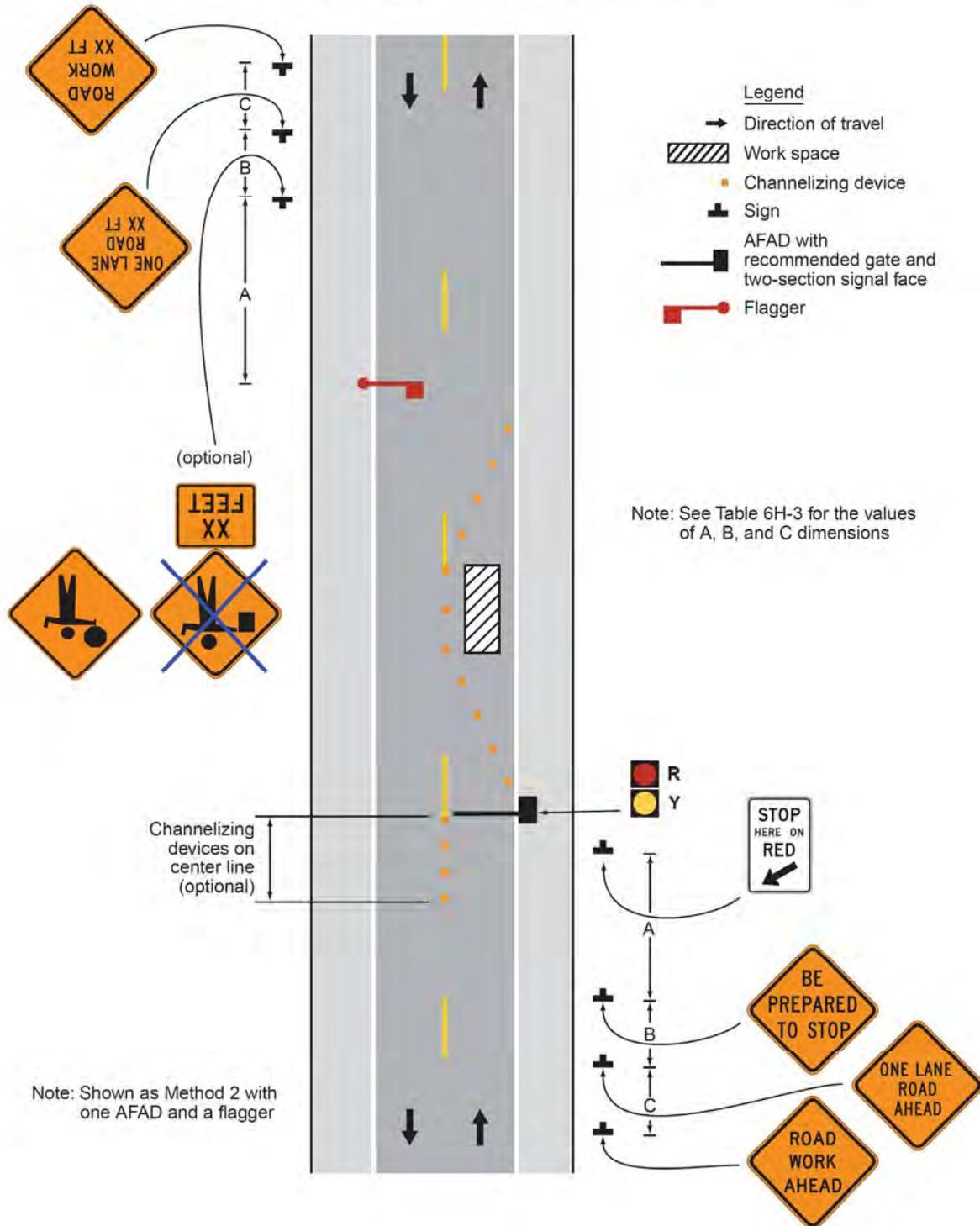
### **Support:**

05 Refer to Construction Safety Orders in the California Code of Regulations (Title 8, Division 1, Chapter 4, Subchapter 4, Article 3, Section 1523 – Illumination and Section 1599 - Flaggers). See Section 1A.11 for information regarding this publication.

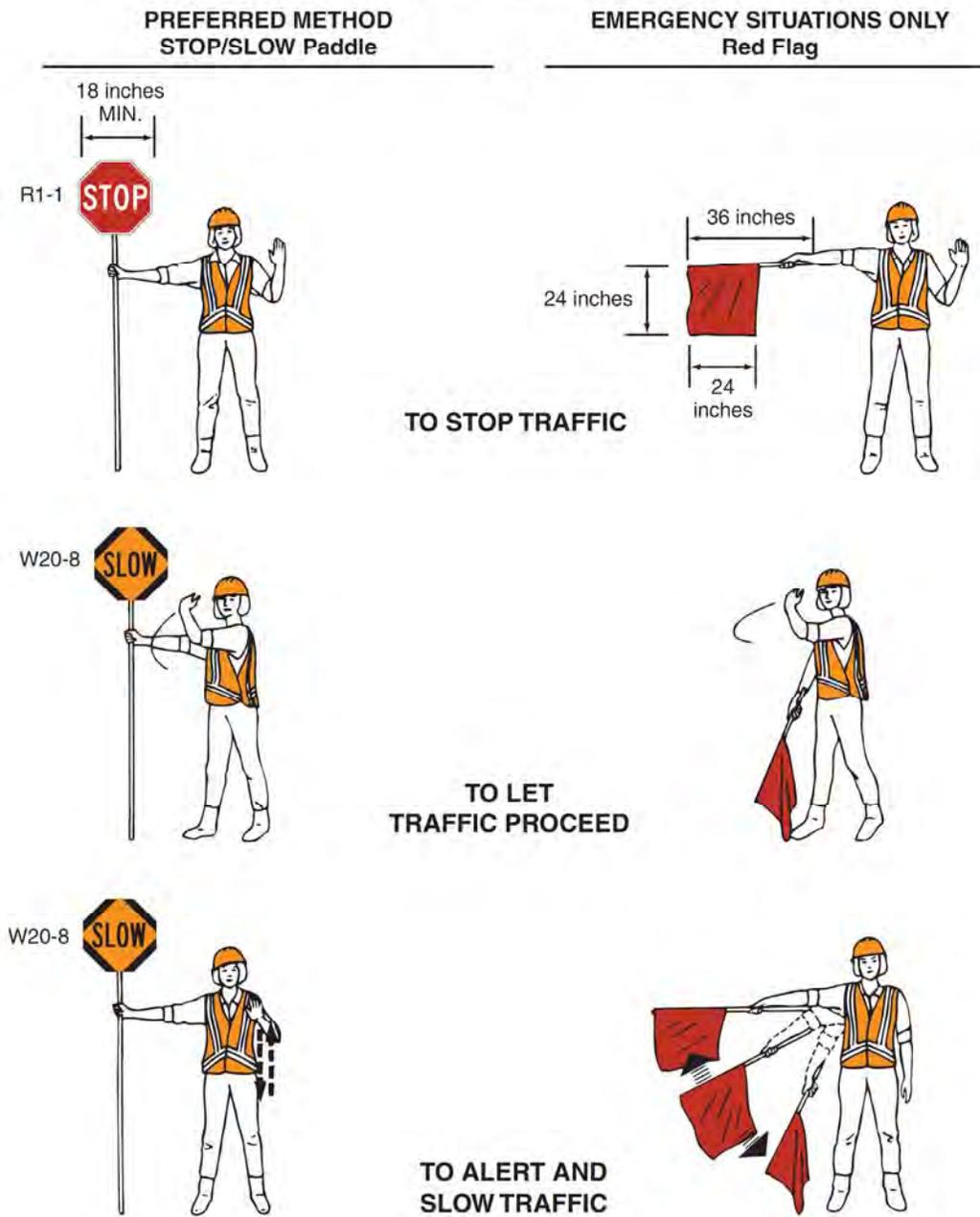
**Figure 6E-1. Example of the Use of a STOP/SLOW Automated Flagger Assistance Device (AFAD)**



**Figure 6E-2. Example of the Use of a Red/Yellow Lens Automated Flagger Assistance Device (AFAD)**



**Figure 6E-3. Use of Hand-Signaling Devices by Flaggers**



**Table 6E-1. Stopping Sight Distance as a Function of Speed**

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

\* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed.  
 Can also be used as Stopping Sight Distance as suggested buffer space length or location for flagger station.

**Table 6E-101(CA). Longitudinal Buffer Space or Flagger Station Spacing on Downgrades**

Speed (mph)	% Downgrade (Buffer Space)		
	-3% (feet)	-6% (feet)	-9% (feet)
20	116	120	126
25	158	165	173
30	205	215	227
35	257	271	287
40	315	333	354
45	378	400	427
50	446	474	507
55	520	553	593
60	598	638	686
65	682	728	785
70	771	825	891

\* Exhibit 3-2. A Policy on Geometric Design of Highways and Streets, AASHTO, 2001, p.115.

## CHAPTER 6F. TEMPORARY TRAFFIC CONTROL ZONE DEVICES

### Section 6F.01 Types of Devices

#### Guidance:

<sup>01</sup> *The design and application of TTC devices used in TTC zones should consider the needs of all road users (motorists, bicyclists, and pedestrians), including those with disabilities.*

#### Support:

<sup>02</sup> FHWA policy requires that all roadside appurtenances such as traffic barriers, barrier terminals and crash cushions, bridge railings, sign and light pole supports, and work zone hardware used on the National Highway System meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features." The FHWA website at "<http://safety.fhwa.dot.gov/programs/roadsideHardware.htm>" identifies all such hardware and includes copies of FHWA acceptance letters for each of them. In the case of proprietary items, links are provided to manufacturers' websites as a source of detailed information on specific devices. The website also contains an "Ask the Experts" section where questions on roadside design issues can be addressed.

<sup>03</sup> Various Sections of the MUTCD require certain traffic control devices, their supports, and/or related appurtenances to be crashworthy. Such MUTCD crashworthiness provisions apply to all streets, highways, and private roads open to public travel. Also, State Departments of Transportation and local agencies might have expanded the NCHRP Report 350 crashworthy criteria to apply to certain other roadside appurtenances.

<sup>04</sup> Crashworthiness and crash testing information on devices described in Part 6 are found in AASHTO's "Roadside Design Guide" (see Section 1A.11).

<sup>05</sup> As defined in Section 1A.13, "crashworthy" is a characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the NCHRP Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features."

#### Standard:

<sup>06</sup> **Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide road users, placed on, over, or adjacent to a street, highway, private roads open to public travel (see definition in Section 1A.13), pedestrian facility, or bikeway by authority of a public body or official having jurisdiction.**

<sup>07</sup> **All traffic control devices used for construction, maintenance, utility, or incident management operations on a street, highway, or private road open to public travel (see definition in Section 1A.13) shall comply with the applicable provisions of this Manual.**

<sup>08</sup> **The Department of Transportation shall implement NCHRP 350 criteria for crashworthy TTC devices in TTC zones on all State highways effective as of December 1, 2005. Crashworthiness of TTC devices shall be substantiated. When no longer needed, TTC devices shall be removed from the TTC zone.**

<sup>09</sup> **Crashworthiness of TTC devices shall be substantiated as follows:**

<sup>10</sup> **Category 1 devices purchased after October 1, 1998 shall be employed based on the vendor's self-certification. Self-certification shall be based on crash testing, crash testing of similar devices, or years of demonstrable safe performance.**

<sup>11</sup> **Category 2 devices shall be on FHWA's list of Acceptable Crashworthy Category 2 Hardware for Work Zones which meet NCHRP Report 350 criteria for crashworthiness. Category 2 devices that have not received FHWA acceptance and were purchased before October 1, 2000, shall not be used. Category 2 devices in use that have received FHWA acceptance shall be labeled with the FHWA acceptance letter number and the name of the manufacturer by the start of the project. The label shall be readable and permanently affixed by the manufacturer. Category 2 devices without a label shall not be used in highway work zones.**

<sup>12</sup> **Category 3 devices shall be crash tested in accordance with NCHRP Report 350 criteria. The Department shall include Standard Special Provision (SSP) 12-000, Standard Plans and construction details in all contract documents.**

#### Support:

<sup>13</sup> For Category 3, the compliance date was October 1, 1998 for truck mounted attenuators and work zone crash cushions. The compliance date for other Category 3 devices was October 1, 2002.

## Section 6F.02 General Characteristics of Signs

### Support:

01 TTC zone signs convey both general and specific messages by means of words, symbols, and/or arrows and have the same three categories as all road user signs: regulatory, warning, and guide.

### Standard:

02 **The colors for regulatory signs shall follow the Standards for regulatory signs in Table 2A-5 2A-5(CA) and Chapter 2B. Warning signs in TTC zones shall have a black legend and border on an orange background, except for the Grade Crossing Advance Warning (W10-1) sign which shall have a black legend and border on a yellow background, and except for signs that are required or recommended in Parts 2 or 7 to have fluorescent yellow-green backgrounds. Colors for guide signs shall follow the Standards in Table 2A-5 2A-5(CA) and Chapter 2D, except for guide signs as otherwise provided in Section 6F.55.**

### Option:

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

### Support:

04 The fluorescent version of orange provides higher conspicuity than standard orange, especially during twilight.

### Option:

05 Existing warning signs that are still applicable may remain in place.

06 In order to maintain the systematic use of yellow or fluorescent yellow-green backgrounds for pedestrian, bicycle, and school warning signs in a jurisdiction, the yellow or fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.

07 Standard orange flags or flashing warning lights may be used in conjunction with signs.

### Standard:

08 **When standard orange flags or flashing warning lights are used in conjunction with signs, they shall not block the sign face.**

09 **Except as provided in Section 2A.11, the sizes for TTC signs and plaques shall be as shown in Table 6F-1 and 6F-1(CA). The sizes in the minimum column shall only be used on local streets or roadways where the 85th-percentile speed or posted speed limit is less than 35 mph.**

### Option:

10 The dimensions of signs and plaques shown in Table 6F-1 and 6F-1(CA) may be increased wherever necessary for greater legibility or emphasis.

### Standard:

11 **Deviations from standard sizes as prescribed in this Manual shall be in 6-inch increments.**

### Support:

12 Sign design details are contained in the "Standard Highway Signs and Markings" book (see Section 1A.11).

13 Section 2A.06 contains additional information regarding the design of signs, including an Option allowing the development of special word message signs if a standard word message or symbol sign is not available to convey the necessary regulatory, warning, or guidance information.

### Standard:

14 **All signs used at night shall be either retroreflective with a material that has a smooth, sealed outer surface or illuminated to show the same shape and similar color both day and night.**

15 **The requirement for sign illumination shall not be considered to be satisfied by street, highway, or strobe lighting.**

15a **TTC zone signs used at night shall maintain retroreflectivity at or above the minimum levels in Table 2A-3.**

### Option:

16 Sign illumination may be either internal or external.

17 Signs may be made of rigid or flexible material.

### Support:

18 Sign design details are contained in FHWA's "Standard Highway Signs and Markings" book and Department of Transportation's California Sign Specifications. See Section 1A.11 for information regarding these publications.

### Section 6F.03 Sign Placement

*Guidance:*

<sup>01</sup> Signs should be located on the right-hand side of the roadway unless otherwise provided in this Manual.

*Option:*

<sup>02</sup> Where special emphasis is needed, signs may be placed on both the left-hand and right-hand sides of the roadway. Signs mounted on portable supports may be placed within the roadway itself. Signs may also be mounted on or above barricades.

*Support:*

<sup>03</sup> The provisions of this Section regarding mounting height apply unless otherwise provided for a particular sign elsewhere in this Manual.

**Standard:**

<sup>04</sup> **The minimum height, measured vertically from the bottom of the sign to the elevation of the near edge of the pavement, of signs installed at the side of the road in rural areas shall be 5 feet (see Figure 6F-1).**

<sup>05</sup> **The minimum height, measured vertically from the bottom of the sign to the top of the curb, or in the absence of curb, measured vertically from the bottom of the sign to the elevation of the near edge of the traveled way, of signs installed at the side of the road in business, commercial, or residential areas where parking or pedestrian movements are likely to occur, or where the view of the sign might be obstructed, shall be 7 feet (see Figure 6F-1).**

<sup>06</sup> **The minimum height, measured vertically from the bottom of the sign to the sidewalk, of signs installed above sidewalks shall be 7 feet.**

*Option:*

<sup>07</sup> The height to the bottom of a secondary sign mounted below another sign may be 1 foot less than the height provided in Paragraphs 4 through 6.

*Guidance:*

<sup>08</sup> ~~Neither portable nor permanent sign supports should be located on sidewalks, bicycle facilities, or areas designated for pedestrian or bicycle traffic.~~ Sign supports should be located so as to accommodate pedestrians and bicyclists in areas designated for their use. A minimum lateral width of 4 feet should be maintained for pedestrian pathways. If the bottom of a secondary sign that is mounted below another sign is mounted lower than 7 feet above a pedestrian sidewalk or pathway (see Section 6D.02), the secondary sign should not project more than 4 inches into the pedestrian facility.

**Standard:**

<sup>09</sup> **Where it has been determined that the accommodation of pedestrians with disabilities is necessary, signs shall be mounted and placed in accordance with Section 4.4 of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).**

<sup>10</sup> **Signs mounted on barricades and barricade/sign combinations shall be crashworthy.**

*Guidance:*

<sup>11</sup> *Except as provided in Paragraph 12, signs (see Figures 6F-3, 6F-4 and 6F-5) mounted on portable sign supports that do not meet the minimum mounting heights provided in Paragraphs 4 through 6 should not be used for a duration of more than 3 days.*

*Option:*

<sup>12</sup> The R9-8 through R9-11a series, R11 series, W1-6 through W1-8 series, M4-10, E5-1, ~~or other similar type signs (see Figures 6F-3, 6F-4, and 6F-5)~~ may be used on portable sign supports that do not meet the minimum mounting heights provided in Paragraphs 4 through 6 for longer than 3 days.

*Support:*

<sup>13</sup> Methods of mounting signs other than on posts are illustrated in Figure 6F-2.

*Guidance:*

<sup>14</sup> *Signs mounted on Type 3 Barricades should not cover more than 50 percent of the top two rails or 33 percent of the total area of the three rails.*

**Standard:**

**15 Sign supports shall be crashworthy. Where large signs having an area exceeding 50 square feet are installed on multiple breakaway posts, the clearance from the ground to the bottom of the sign shall be at least 7 feet.**

**16 The bottom of a sign mounted on a barricade, or other portable support, shall be at least 1 foot above the traveled way.**

**Option:**

17 For mobile operations, a sign may be mounted on a work vehicle, a shadow vehicle, or a trailer stationed in advance of the TTC zone or moving along with it.

**Support:**

18 If alterations are made to specific traffic control device supports that have been successfully crash tested in accordance with NCHRP Report 350, the altered supports might not be considered to be crashworthy.

19 Refer to Section 2A.21 for mounting of small plastic signs on channelizers (CA), cones or portable delineators.

**Section 6F.04 Sign Maintenance**

*Guidance:*

01 Signs should be properly maintained for cleanliness, visibility, and correct positioning.

02 Signs that have lost significant legibility should be promptly replaced.

**Support:**

03 Section 2A.08 contains information regarding the retroreflectivity of signs, including the signs that are used in TTC zones.

**Section 6F.05 Regulatory Sign Authority**

**Support:**

01 Regulatory signs such as those shown in Figure 6F-3 inform road users of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.

**Standard:**

**02 Regulatory signs shall be authorized by the public agency or official having jurisdiction and shall conform with Chapter 2B.**

**Support:**

03 Some of the California regulatory signs used in TTC zones are shown in Figure 6F-101(CA) and Table 6F-1(CA).

**Section 6F.06 Regulatory Sign Design**

**Standard:**

**01 TTC regulatory signs shall comply with the Standards for regulatory signs presented in Part 2 and in the FHWA's "Standard Highway Signs and Markings" book (see Section 1A.11).**

**Support:**

02 Regulatory signs are generally rectangular with a black legend and border on a white background. Exceptions include the STOP, YIELD, DO NOT ENTER, WRONG WAY, and ONE WAY signs.

**Option:**

03 The ONE WAY sign may be either a horizontal or vertical rectangular sign.

**Section 6F.07 Regulatory Sign Applications**

**Standard:**

**01 If a TTC zone requires regulatory measures different from those existing, the existing permanent regulatory devices shall be removed or covered and superseded by the appropriate temporary regulatory signs. This change shall be made in compliance with applicable ordinances or statutes of the jurisdiction.**

### **Section 6F.08 ROAD (STREET) CLOSED Sign (R11-2)**

*Guidance:*

01 *The ROAD (STREET) CLOSED (R11-2) sign (see Figure 6F-3) should be used when the roadway is closed to all road users except contractors' equipment or officially authorized vehicles. The R11-2 sign should be accompanied by appropriate warning and detour signing.*

*Option:*

02 The words ~~BRIDGE OUT~~ (or BRIDGE CLOSED) may be substituted for ROAD (STREET) CLOSED where applicable.

*Guidance:*

03 *The ROAD (STREET) CLOSED sign should be installed at or near the center of the roadway on or above a Type 3 Barricade that closes the roadway (see Section 6F.68).*

**Standard:**

04 **The ROAD (STREET) CLOSED sign shall not be used where road user flow is maintained through the TTC zone with a reduced number of lanes on the existing roadway or where the actual closure is some distance beyond the sign.**

### **Section 6F.09 Local Traffic Only Signs (R11-3a, R11-4)**

*Guidance:*

01 *The Local Traffic Only signs (see Figure 6F-3) should be used where road user flow detours to avoid a closure some distance beyond the sign, but where local road users can use the roadway to the point of closure. These signs should be accompanied by appropriate warning and detour signing.*

02 *In rural applications, the Local Traffic Only sign should have the legend ROAD CLOSED XX MILES AHEAD, LOCAL TRAFFIC ONLY (R11-3a).*

*Option:*

03 In urban areas, the legend ROAD (STREET) CLOSED TO THRU TRAFFIC (R11-4) or ROAD CLOSED, LOCAL TRAFFIC ONLY may be used.

04 In urban areas, a word message that includes the name of an intersecting street name or well-known destination may be substituted for the words XX MILES AHEAD on the R11-3a sign where applicable.

05 The words ~~BRIDGE OUT~~ (or BRIDGE CLOSED) may be substituted for the words ROAD (STREET) CLOSED on the R11-3a or R11-4 sign where applicable.

*Option:*

06 The word RAMP may be substituted for ROAD or STREET where applicable.

### **Section 6F.10 Weight Limit Signs (R12-1, R12-2, R12-5)**

**Standard:**

01 **A Weight Limit sign (see Figure 6F-3), which shows the gross weight ~~or axle weight~~ that is permitted on the roadway or bridge, shall be consistent with State or local regulations and shall not be installed without the approval of the authority having jurisdiction over the highway.**

02 **When weight restrictions are imposed because of the activity in a TTC zone, a marked detour shall be provided for vehicles weighing more than the posted limit.**

### **Section 6F.11 STAY IN LANE Sign (R4-9)**

*Option:*

01 A STAY IN LANE (R4-9) sign (see Figure 6F-3) may be used where a multi-lane shift has been incorporated as part of the TTC on a highway to direct road users around road work that occupies part of the roadway on a multi-lane highway.

### **Section 6F.12 Work Zone and Higher Fines Signs and Plaques**

*Option:*

01 A WORK ZONE (G20-5aP) plaque (see Figure 6F-3) may be mounted above a Speed Limit sign to emphasize that a reduced speed limit is in effect within a TTC zone. An END WORK ZONE SPEED LIMIT (R2-12) sign (see Figure 6F-3) may be installed at the downstream end of the reduced speed limit zone.

*Guidance:*

02 A ~~BEGIN HIGHER~~ **DOUBLE FINES ZONE (R2-10)** sign (see Figure 6F-3) should be installed at the upstream end of a work zone where increased fines are imposed for traffic violations, and an ~~END HIGHER~~ **DOUBLE FINES ZONE (R2-11)** sign (see Figure 6F-3) should be installed at the downstream end of the work zone.

*Option:*

03 Alternate legends such as BEGIN (or END) DOUBLE FINES ZONE may also be used for the R2-10 and R2-11 signs.

04 A ~~FINES HIGHER~~, FINES DOUBLE, or ~~\$\$\$ FINE~~ plaque (see Section 2B.17 and Figure 6F-3) may be mounted below the Speed Limit sign if increased fines are imposed for traffic violations within the TTC zone.

05 Individual signs and plaques for work zone speed limits and higher fines may be combined into a single sign or may be displayed as an assembly of signs and plaques.

06 The TRAFFIC FINES DOUBLED IN CONSTRUCTION ZONES (C40(CA)) and TRAFFIC FINES DOUBLED IN WORK ZONES (C40A(CA)) signs may be placed approximately 500 feet in advance of the first required TTC sign(s). The placement of the C40(CA) and C40A(CA) signs is at the discretion of the responsible person(s) in charge of the work zone.

*Support:*

07 Refer to CVC 42009 for fines for offenses committed in highway construction or maintenance area. In California, as per CVC only doubling of the fines is allowed, not higher fines of other denominations.

*Guidance:*

08 The C40A(CA) sign is intended to be manufactured as a fabric sign and should be used on a short term (daily) basis only. Longer term situations should use the C40(CA) sign.

*Support:*

09 CVC 22362 applies to "When Workers are Present" condition and signs need to be covered or removed when no work is in progress. However, per CVC 21367, agency can "...regulate the movement of traffic...whenever the traffic would endanger the safety of workers or the work would interfere with or endanger the movement of traffic through the area." If obstructions would be present throughout the project duration the signs would not need to be covered or removed. This would also apply to situations where the construction work changes the highway configuration, curvature or elevation, making it necessary to post reduced speed limits.

*Option:*

10 A WORK ZONE (G20-5aP) plaque may be mounted above a Speed Limit sign to emphasize that a permanent (24 hours a day, 7 days a week) reduced speed limit is in effect within a TTC zone. An END WORK ZONE SPEED LIMIT (R2-12) sign (see Figure 6F-3) may be installed at the downstream end of the reduced speed limit zone.

11 The Road Work/Speed Limit (C17(CA)) sign may be used for the protection of workers during working hours to reduce speed limit within a TTC zone.

**Standard:**

12 **The C17(CA) sign shall only be used in conjunction with appropriate advance warning signs.**

13 **The C17(CA) signs shall be removed or covered promptly when no longer applicable.**

*Support:*

14 The C17(CA) sign is authorized for use by CVC Section 22362. This section provides authority to post a speed limit of not less than 25 mph at locations where employees of any contractor, or of the agency in charge of the job, are engaged in work upon the roadway.

15 Posting unrealistically low speed limits will result in loss of sign credibility and a high violation rate.

*Guidance:*

16 Before using a C17(CA) sign, work zone conditions should be analyzed to determine what maximum speed limit would be appropriate for that particular location.

17 The C17(CA) sign should be placed within 400 feet of the zone where workers are on the roadway or so nearly adjacent as to be endangered by traffic.

*Option:*

18 The C17(CA) sign may be provided by the agency having jurisdiction over the street or road.

*Guidance:*

19 The C17(CA) should be posted a maximum distance of 400 feet in advance of where, and when workers are present; and the Speed Reduction (W3-5) sign or Speed Zone Ahead (R2-4(CA)) sign informs road users of the reduced speed limit TTC zone.

### **Section 6F.13 PEDESTRIAN CROSSWALK Sign (R9-8)**

Option:

01 The PEDESTRIAN CROSSWALK (R9-8) sign (see Figure 6F-3) may be used to indicate where a temporary crosswalk has been established.

**Standard:**

02 **If a temporary crosswalk is established, it shall be accessible to pedestrians with disabilities in accordance with Section 6D.02.**

### **Section 6F.14 SIDEWALK CLOSED Signs (R9-9, R9-10, R9-11, R9-11a)**

Guidance:

01 *SIDEWALK CLOSED* signs (see Figure 6F-3) should be used where pedestrian flow is restricted. *Bicycle/Pedestrian Detour (M4-9a)* signs or *Pedestrian Detour (M4-9b)* signs should be used where pedestrian flow is rerouted (see Section 6F.59).

02 *The SIDEWALK CLOSED (R9-9) sign should be installed at the beginning of the closed sidewalk, at the intersections preceding the closed sidewalk, and elsewhere along the closed sidewalk as needed.*

03 *The SIDEWALK CLOSED, (ARROW) USE OTHER SIDE (R9-10) sign should be installed at the beginning of the restricted sidewalk when a parallel sidewalk exists on the other side of the roadway.*

04 *The SIDEWALK CLOSED AHEAD, (ARROW) CROSS HERE (R9-11) sign should be used to indicate to pedestrians that sidewalks beyond the sign are closed and to direct them to open crosswalks, sidewalks, or other travel paths.*

05 *The SIDEWALK CLOSED, (ARROW) CROSS HERE (R9-11a) sign should be installed just beyond the point to which pedestrians are being redirected.*

Support:

06 These signs are typically mounted on a detectable barricade to encourage compliance and to communicate with pedestrians that the sidewalk is closed. Printed signs are not useful to many pedestrians with visual disabilities. A barrier or barricade detectable by a person with a visual disability is sufficient to indicate that a sidewalk is closed. If the barrier is continuous with detectable channelizing devices for an alternate route, accessible signing might not be necessary. An audible information device is needed when the detectable barricade or barrier for an alternate channelized route is not continuous.

### **Section 6F.15 Special Regulatory Signs**

Option:

01 Special regulatory signs may be used based on engineering judgment consistent with regulatory requirements.

Guidance:

02 *Special regulatory signs should comply with the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.*

### **Section 6F.16 Warning Sign Function, Design, and Application**

Support:

01 TTC zone warning signs (see Figure 6F-4) notify road users of specific situations or conditions on or adjacent to a roadway that might not otherwise be apparent.

**Standard:**

02 **TTC warning signs shall comply with the Standards for warning signs presented in Part 2 and in FHWA's "Standard Highway Signs and Markings" book (see Section 1A.11). Except as provided in Paragraph 3, TTC warning signs shall be diamond-shaped with a black legend and border on an orange (or fluorescent orange) background, except for the W10-1 sign which shall have a black legend and border on a yellow background, and except for signs that are required or recommended in Parts 2 or 7 to have fluorescent yellow-green backgrounds.**

Option:

03 Warning signs used for TTC incident management situations may have a black legend and border on a fluorescent pink background.

04 Mounting or space considerations may justify a change from the standard diamond shape.

05 In emergencies, available warning signs having yellow backgrounds may be used if signs with orange or fluorescent pink backgrounds are not at hand.

*Guidance:*

06 Where roadway or road user conditions require greater emphasis, larger than standard size warning signs should be used, with the symbol or legend enlarged approximately in proportion to the outside dimensions.

07 Where any part of the roadway is obstructed or closed by work activities or incidents, advance warning signs should be installed to alert road users well in advance of these obstructions or restrictions.

08 Where road users include pedestrians, the provision of supplemental audible information or detectable barriers or barricades should be considered for people with visual disabilities.

*Support:*

09 Detectable barriers or barricades communicate very clearly to pedestrians who have visual disabilities that they can no longer proceed in the direction that they are traveling.

*Option:*

10 Advance warning signs may be used singly or in combination.

11 Where distances are not displayed on warning signs as part of the message, a supplemental plaque with the distance legend may be mounted immediately below the sign on the same support.

*Support:*

12 Some of the California warning signs used in TTC zones are shown in Figure 6F-101(CA) and Table 6F-1(CA).

### **Section 6F.17 Position of Advance Warning Signs**

*Guidance:*

01 Where highway conditions permit, warning signs should be placed in advance of the TTC zone at varying distances depending on roadway type, condition, and posted speed. Table 6C-1 contains information regarding the spacing of advance warning signs. Where a series of two or more advance warning signs is used, the closest sign to the TTC zone should be placed approximately 100 feet for low-speed urban streets to 1,000 feet or more for freeways and expressways.

02 Where multiple advance warning signs are needed on the approach to a TTC zone, the ROAD WORK AHEAD (W20-1) sign should be the first advance warning sign encountered by road users.

*Support:*

03 Various conditions, such as limited sight distance or obstructions that might require a driver to reduce speed or stop, might require additional advance warning signs.

*Option:*

04 As an alternative to a specific distance on advance warning signs, the word AHEAD may be used.

*Support:*

05 At TTC zones on lightly-traveled roads, all of the advance warning signs prescribed for major construction might not be needed.

*Option:*

06 Utility work, maintenance, or minor construction can occur within the TTC zone limits of a major construction project, and additional warning signs may be needed.

*Guidance:*

07 Utility, maintenance, and minor construction signing and TTC should be coordinated with appropriate authorities so that road users are not confused or misled by the additional TTC devices.

### **Section 6F.18 ROAD (STREET) WORK Sign (W20-1)**

*Guidance:*

01 The ROAD (STREET) WORK (W20-1) sign (see Figure 6F-4), which serves as a general warning of obstructions or restrictions, should be located in advance of the work space or any detour, on the road where the work is taking place.

02 Where traffic can enter a TTC zone from a crossroad or a major (high-volume) driveway, an advance warning sign should be used on the crossroad or major driveway.

**Standard:**

**03 The ROAD (STREET) WORK (W20-1) sign shall have the legend ROAD (STREET) WORK, XX FEET, XX MILES, or AHEAD.**

**Option:**

04 The RAMP WORK AHEAD (C23(CA)) sign may be substituted for W20-1 sign where applicable.

05 The ROAD (STREET) WORK Informational plaque (C23B(CA)) may be used with ROAD (STREET) WORK (W20-1) sign.

**Standard:**

**06 The message displayed on the ROAD (STREET) WORK Informational plaque (C23B(CA)) shall be worded in terms common to motorists, as shown in examples below. The height and width of the plate will vary according to the lettering size and message. The width of the plate shall not exceed the overall width of the W20-1 sign.**

**Support:**

07 Following are some example messages:

- A. BRIDGE REPLACEMENT
- B. BRIDGE WIDENING
- C. BRIDGE REPAIR
- D. CURVE IMPROVEMENT
- E. HIGHWAY REALIGNMENT
- F. HIGHWAY WIDENING
- G. HIGHWAY WIDENING AND PAVING
- H. HIGHWAY REHABILITATION
- I. STORM REPAIR
- J. PAVING
- K. SIGNING IMPROVEMENT
- L. PAVEMENT MAINTENANCE
- M. SAFETY IMPROVEMENT

**Guidance:**

08 The SPECIAL EVENT AHEAD (SC5(CA)) sign should be used in lieu of the ROAD (STREET) WORK (W20-1) sign for special events, such as bike races, movie filming, etc., where the event is on the travel way or close enough or of such a nature as to have a potential effect on motorists, bicyclists and pedestrians.

**Section 6F.19 DETOUR Sign (W20-2)**

**Guidance:**

**Standard:**

**01 The DETOUR (W20-2) sign (see Figure 6F-4) should shall be used in advance of a road user detour over a different roadway or route. Refer to CVC 21363 for detour signs.**

**Standard:**

**02 The DETOUR sign shall have the legend DETOUR, XX FEET, XX MILES, or AHEAD.**

**Section 6F.20 ROAD (STREET) CLOSED Sign (W20-3)**

**Guidance:**

01 The ROAD (STREET) CLOSED (W20-3) sign (see Figure 6F-4) should be used in advance of the point where a highway is closed to all road users, or to all but local road users.

**Standard:**

**02 The ROAD (STREET) CLOSED sign shall have the legend ROAD (STREET) CLOSED, XX FEET, XX MILES, or AHEAD.**

**Section 6F.21 ONE LANE ROAD Sign (W20-4)**

**Standard:**

**01 The ONE LANE ROAD (W20-4) sign (see Figure 6F-4) shall be used only in advance of that point where motor vehicle traffic in both directions must use a common single lane (see Section 6C.10). It shall have the legend ONE LANE ROAD, XX FEET, XX MILES, or AHEAD.**

### **Section 6F.22 Lane(s) Closed Signs (W20-5, W20-5a)**

#### **Standard:**

**01 The Lane(s) Closed sign (see Figure 6F-4) shall be used in advance of that point where one or more through lanes of a multi-lane roadway are closed.**

**02 For a single lane closure, the Lane Closed (W20-5) sign (see Figure 6F-4) shall have the legend RIGHT (LEFT) LANE CLOSED, XX FEET, XX MILES, or AHEAD. Where two adjacent lanes are closed, the W20-5a sign (see Figure 6F-4) shall have the legend XX RIGHT (LEFT) LANES CLOSED, XX FEET, XX MILES, or AHEAD.**

#### **Option:**

**03 The Lane Closed (W20-5 or C20(CA)) sign by itself, or in combination with LEFT (C20A(CA)) plaque and/or Numeral (C20B(CA)) plaque may be used.**

**04 The LANE CLOSED (C30(CA)) sign may be used within a closed lane of a multilane highway as follow-up information to the appropriate advance warning signs. The C30(CA) sign may be repeated at intervals, throughout long lane closures, as a reminder to motorists.**

**05 The words RAMP CLOSED may be used as an alternate message on the C30(CA) signs on surface streets to warn that the upcoming freeway/expressway on ramp is closed.**

### **Section 6F.23 CENTER LANE CLOSED AHEAD Sign (W9-3)**

#### **Guidance:**

**01 The CENTER LANE CLOSED AHEAD (W9-3) sign (see Figure 6F-4) should be used in advance of that point where work occupies the center lane(s) and approaching motor vehicle traffic is directed to the right or left of the work zone in the center lane.**

#### **Support:**

**02 For moving lane closures on State highways, see Department of Transportation's Standard Plan T-16. See Section 1A.11 for information regarding this publication.**

**03 Do not use the CENTER LANE CLOSED AHEAD (W9-3) sign for moving lane closures on State highways.**

### **Section 6F.24 Lane Ends Sign (W4-2)**

#### **Option:**

#### **Guidance:**

**01 The Lane Ends (W4-2) symbol sign (see Figure 6F-4) ~~may~~ should be used to warn drivers of the reduction in the number of lanes for moving motor vehicle traffic in the direction of travel on a multi-lane roadway.**

### **Section 6F.25 ON RAMP Plaque (W13-4P)**

#### **Guidance:**

**01 ~~When work is being done on a ramp, but the ramp remains open, the ON RAMP (W13-4P) plaque (see Figure 6F-4) should be used to supplement the advance ROAD WORK sign.~~**

#### **Standard:**

**02 The ON RAMP (W13-4) plaque shall not be used in California due to the potential for conflict if it is used when the work is being done on an off ramp.**

### **Section 6F.26 RAMP NARROWS Sign (W5-4)**

#### **Guidance:**

**01 ~~The RAMP NARROWS (W5-4) sign (see Figure 6F-4) should be used in advance of the point where work on a ramp reduces the normal width of the ramp along a part or all of the ramp.~~**

#### **Standard:**

**02 The RAMP NARROWS (W5-4) sign shall not be used in California. The ROAD NARROWS (W5-1) sign or NARROW LANE(S) (C12(CA)) sign, as appropriate, shall be used instead. See Sections 2C.19 and 6F.102(CA).**

### **Section 6F.27 SLOW TRAFFIC AHEAD Sign (W23-1)**

**Option:**

01 The SLOW TRAFFIC AHEAD (W23-1) sign (see Figure 6F-4) may be used on a shadow vehicle, usually mounted on the rear of the most upstream shadow vehicle, along with other appropriate signs for mobile operations to warn of slow moving work vehicles. A ROAD (STREET) WORK (W20-1) sign may also be used with the SLOW TRAFFIC AHEAD sign.

### **Section 6F.28 EXIT OPEN and EXIT CLOSED Signs (E5-2, E5-2a)**

**Option:**

01 An EXIT OPEN (E5-2) or EXIT CLOSED (E5-2a) sign (see Figure 6F-5) may be used to supplement other warning signs where work is being conducted in the vicinity of an exit ramp and where the exit maneuver for vehicular traffic using the ramp is different from the normal condition.

**Guidance:**

02 *When an exit ramp is closed, an EXIT CLOSED sign panel with a black legend and border on an orange background should be placed diagonally across the interchange/intersection guide signs.*

**Standard:**

03 **The RAMP CLOSED (C2(CA)) sign (see Figure 6F-101(CA)) shall be used at the entrance of the on or off ramp that is closed to all road users. The RAMP CLOSED (Not more than one day) (SC6-3(CA)) sign and The RAMP CLOSED (More than one day) (SC6-4(CA)) sign shall not be used in lieu of the C2(CA) sign.**

**Option:**

04 The RAMP CLOSED, USE RAMP AT \_\_\_ (SC7(CA)) sign may be used in lieu of the RAMP CLOSED (C2(CA)) sign.

**Guidance:**

05 *The RAMP CLOSED AHEAD (C19(CA)) sign (see Figure 6F-101(CA)) should be used in advance of the point where a on or off ramp is closed to all road users.*

**Option:**

06 The USE NEXT EXIT (C38(CA)) sign may be used with the RAMP CLOSED (C2(CA)) sign on freeways if the next exit provides access to destinations from the closed ramp.

**Guidance:**

07 *The RAMP CLOSED (Not more than one day) (SC6-3(CA)) sign should be used to inform motorists of the temporary closing of a freeway or expressway entrance or exit ramp for not more than one day.*

08 *The RAMP CLOSED (More than one day) (SC6-4(CA)) sign should be used to inform motorists of the temporary closing of a freeway or expressway entrance or exit ramp for more than one day.*

09 *The SC6-3(CA) and SC6-4(CA) signs should be removed when the ramp is reopened to traffic.*

**Standard:**

10 **The SC6-3(CA) and SC6-4(CA) signs shall display the correct day of the week, month, calendar day and times the ramp is closed.**

**Support:**

11 The Day/Month (SC6A(CA)) plaque is used on the RAMP CLOSED (SC6-3(CA) and SC6-4(CA)) signs, to provide the appropriate day of the week and month a freeway or expressway entrance or exit ramp is closed.

12 The Time (SC6B(CA)) plaque is used on the RAMP CLOSED (SC6-3(CA) and SC6-4(CA)) signs, to provide the appropriate time of the day a freeway or expressway entrance or exit ramp is closed.

**Option:**

13 The RAMP CLOSED, USE RAMP AT \_\_\_ (SC7(CA)) sign may be used in lieu of the RAMP CLOSED (C2(CA)) sign and USE NEXT EXIT (C38(CA)) signs as shown on Department of Transportation's Standard Plan T-14 to inform motorists of a closed entrance or exit ramp and to provide an alternate route. See Section 1A.11 for information regarding these publication.

**Guidance:**

14 *The \_\_\_ EXIT – RAMP CLOSED (SC8(CA)) sign should be used to inform motorists of a closed exit ramp.*

**Standard:**

15 **The SC8(CA) sign shall be placed on the right shoulder, upstream of the preceding exit ramp.**

**Guidance:**

16 *The EXIT with Arrow (SC18(CA)) sign should be used to inform motorists of the direction to follow for a freeway exit within a work zone.*

### **Section 6F.29 EXIT ONLY Sign (E5-3)**

Option:

01 An EXIT ONLY (E5-3) sign (see Figure 6F-5) may be used to supplement other warning signs where work is being conducted in the vicinity of an exit ramp and where the exit maneuver for vehicular traffic using the ramp is different from the normal condition.

### **Section 6F.30 NEW TRAFFIC PATTERN AHEAD Sign (W23-2)**

Option:

01 A NEW TRAFFIC PATTERN AHEAD (W23-2) sign (see Figure 6F-4) may be used on the approach to an intersection or along a section of roadway to provide advance warning of a change in traffic patterns, such as revised lane usage, roadway geometry, or signal phasing.

Guidance:

02 *To retain its effectiveness, the W23-2 sign should be displayed for up to 2 weeks, and then it should be covered or removed until it is needed again.*

### **Section 6F.31 Flagger Signs (W20-7, W20-7a)**

Guidance:

01 *The ~~Flagger (W20-7) symbol sign (see Figure 6F-4)~~ California Flagger symbol (C9A(CA)) sign (see Figure 6F-101(CA)) should be used in advance of any point where a flagger is stationed to control road users.*

Option:

02 A distance legend may be displayed on a supplemental plaque below the Flagger sign. The sign may be used with appropriate legends or in conjunction with other warning signs, such as the BE PREPARED TO STOP (W3-4) sign (see Figure 6F-4).

03 The FLAGGER (W20-7a) word message sign with distance legends may be substituted for the ~~Flagger (W20-7) symbol sign~~ California Flagger symbol (C9A(CA)) sign.

04 **The MUTCD Flagger symbol (W20-7a) sign shall not be used, the California Flagger symbol (C9A(CA)) sign shall be used, instead.**

### **Section 6F.32 Two-Way Traffic Sign (W6-3)**

Guidance:

01 *When one roadway of a normally divided highway is closed, with two-way vehicular traffic maintained on the other roadway, the Two-Way Traffic (W6-3) sign (see Figure 6F-4) should be used at the beginning of the two-way vehicular traffic section and at intervals to remind road users of opposing vehicular traffic.*

Guidance:

02 *The Two-Way Traffic (W6-3) sign should also be used at locations where motorists could perceive that they are on a one-way roadway when, in fact, they are on a two lane, two-way highway.*

Support:

03 Following are some typical situations:

- A. Construction sites where a two-lane highway is being converted to a freeway or an expressway.
- B. Two-lane, two-way highways where ultimate freeway or expressway right-of-way has been purchased and grading for the full width has been completed.
- C. Two-lane, two-way highways following long sections of multi-lane freeway or expressway.
- D. Lane-shift as shown in Figure 6H-105(CA).

### **Section 6F.33 Workers Signs (W21-1, W21-1a)**

Option:

01 A Workers (W21-1) symbol sign (see Figure 6F-4) may be used to alert road users of workers in or near the roadway.

Guidance:

02 *In the absence of other warning devices, a Workers symbol sign should be used when workers are in the roadway.*

Option:

03 The WORKERS (W21-1a) word message sign may be used as an alternate to the Workers (W21-1) symbol sign.

**Section 6F.34 FRESH OIL (TAR) Sign (W21-2)**

Guidance:

01 The FRESH OIL (TAR) (W21-2) sign (see Figure 6F-4) should be used to warn road users of the surface treatment.

**Section 6F.35 ROAD MACHINERY AHEAD Sign (W21-3)**

Option:

01 The ROAD MACHINERY AHEAD (W21-3) sign (see Figure 6F-4) may be used to warn of machinery operating in or adjacent to the roadway.

**Section 6F.36 Motorized Traffic Signs (W8-6, W11-10)**

Option:

01 Motorized Traffic (W8-6, W11-10 or C44(CA)) signs may be used to alert road users to locations where unexpected travel on the roadway or entries into or departures from the roadway by construction vehicles might occur. The TRUCK CROSSING (W8-6) or TRUCKS ENTERING EXITING (C44(CA)) word message sign may be used as an alternate to the Truck Crossing (W11-10) symbol sign (see Figure 6F-4) where there is an established construction vehicle crossing of the roadway.

Support:

02 These locations might be relatively confined or might occur randomly over a segment of roadway.

**Section 6F.37 Shoulder Work Signs (W21-5, W21-5a, W21-5b)**

Support:

01 Shoulder Work signs (see Figure 6F-4) warn of maintenance, reconstruction, or utility operations on the highway shoulder where the roadway is unobstructed.

**Standard:**

02 The Shoulder Work sign shall have the legend SHOULDER WORK (W21-5), RIGHT (LEFT) SHOULDER CLOSED (W21-5a), or RIGHT (LEFT) SHOULDER CLOSED XX FT or AHEAD (W21-5b) or SHOULDER WORK AHEAD (C24(CA)).

Option:

03 The Shoulder Work sign may be used in advance of the point on a non-limited access highway where there is shoulder work. It may be used singly or in combination with a ROAD WORK NEXT XX MILES or ROAD WORK AHEAD sign.

Guidance:

04 On freeways and expressways, the RIGHT (LEFT) SHOULDER CLOSED XX FT or AHEAD (W21-5b) sign followed by RIGHT (LEFT) SHOULDER CLOSED (W21-5a) sign should be used in advance of the point where the shoulder work occurs and should be preceded by a ROAD WORK AHEAD sign.

Option:

05 The SHOULDER WORK AHEAD (C24(CA)) sign may be used in advance of the point where maintenance, reconstruction, or utility operations involve the shoulder but the roadway is unobstructed.

06 The SHOULDER CLOSED (C30A(CA)) sign may be used within a shoulder area that has been closed due to work near the traveled way. The C30A(CA) sign is supplemental to appropriate advance warning signs.

**Section 6F.38 SURVEY CREW Sign (W21-6)**

Guidance:

01 The SURVEY CREW (W21-6) sign (see Figure 6F-4) should be used to warn of surveying crews working in or adjacent to the roadway.

### **Section 6F.39 UTILITY WORK Sign (W21-7)**

**Option:**

01 The UTILITY WORK (W21-7) sign (see Figure 6F-4) may be used as an alternate to the ROAD (STREET) WORK (W20-1) sign for utility operations on or adjacent to a highway.

**Support:**

02 Typical examples of where the UTILITY WORK sign is used appear in Figures ~~6H-4~~ 6H-4(CA), 6H-6, ~~6H-10~~ 6H-10(CA), 6H-15, 6H-18, 6H-21, 6H-22, 6H-26, and 6H-33.

**Standard:**

03 **The UTILITY WORK sign shall carry the legend UTILITY WORK, XX FEET, XX MILES, or AHEAD.**

### **Section 6F.40 Signs for Blasting Areas**

**Support:**

01 Radio-Frequency (RF) energy can cause the premature firing of electric detonators (blasting caps) used in TTC zones.

**Standard:**

02 **Road users shall be warned to turn off mobile radio transmitters and cellular telephones where blasting operations occur. A sequence of signs shall be prominently displayed to direct operators of mobile radio equipment, including cellular telephones, to turn off transmitters in a blasting area. These signs shall be covered or removed when there are no explosives in the area or the area is otherwise secured.**

### **Section 6F.41 BLASTING ZONE AHEAD Sign (W22-1)**

**Standard:**

01 **The BLASTING ZONE AHEAD (W22-1) sign (see Figure 6F-4) shall be used in advance of any TTC zone where explosives are being used. The TURN OFF 2-WAY RADIO AND CELL PHONE and END BLASTING ZONE signs shall be used in sequence with this sign.**

### **Section 6F.42 TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2)**

**Standard:**

01 **The TURN OFF 2-WAY RADIO AND CELL PHONE (W22-2) sign (see Figure 6F-4) shall follow the BLASTING ZONE AHEAD sign and shall be placed at least 1,000 feet before the beginning of the blasting zone.**

### **Section 6F.43 END BLASTING ZONE Sign (W22-3)**

**Standard:**

01 **The END BLASTING ZONE (W22-3) sign (see Figure 6F-4) shall be placed a minimum of 1,000 feet past the blasting zone.**

**Option:**

02 The END BLASTING ZONE sign may be placed either with or preceding the END ROAD WORK sign.

### **Section 6F.44 Shoulder Signs and Plaque (W8-4, W8-9, W8-17, and W8-17P)**

**Option:**

01 The SOFT SHOULDER (W8-4) sign (see Figure 6F-4) may be used to warn of a soft shoulder condition.

02 The LOW SHOULDER (W8-9) sign (see Figure 6F-4) may be used to warn of a shoulder condition where there is an elevation difference of 3 inches or less between the shoulder and the travel lane.

**Guidance:**

03 *The Shoulder Drop Off (W8-17) sign (see Figure 6F-4) should be used when an unprotected shoulder drop-off, adjacent to the travel lane, exceeds 3 inches in depth for a continuous length along the roadway, based on engineering judgment.*

**Option:**

04 A SHOULDER DROP-OFF (W8-17P) supplemental plaque (see Figure 6F-4) may be mounted below the W8-17 sign.

Option:

<sup>05</sup> The NO SHOULDER (C31A(CA)) sign may be used where no earth, gravel or paved shoulders are available for vehicles to pull off the roadway.

### **Section 6F.45 UNEVEN LANES Sign (W8-11)**

Guidance:

<sup>01</sup> The UNEVEN LANES (W8-11) sign (see Figure 6F-4) should be used during operations that create a difference of 2 inch or more in elevation between adjacent lanes that are open to travel.

Option:

<sup>02</sup> When warning is intended to be directed primarily to motorcyclists, or when elevation difference is less than 2 inch but will affect motorcycle operation, use of the UNEVEN LANES (W8-11) sign with motorcycle plaque (W8-15P) may be considered.

### **Section 6F.46 STEEL PLATE AHEAD Sign (W8-24)**

Option:

<sup>01</sup> A STEEL PLATE AHEAD (W8-24) sign (see Figure 6F-4) may be used to warn road users that the presence of a temporary steel plate(s) might make the road surface uneven and might create slippery conditions during wet weather.

### **Section 6F.47 NO CENTER LINE Sign (W8-12)**

Guidance:

<sup>01</sup> The NO CENTER LINE (W8-12) sign (see Figure 6F-4) should be used when the work obliterates the center line pavement markings and when temporary pavement centerline markings are not provided. This sign should be placed at the beginning of the TTC zone and repeated at 2-mile intervals in long TTC zones.

Support:

<sup>02</sup> Section 6F.78 contains information regarding temporary markings.

Standard:

<sup>03</sup> The NO CENTER STRIPE (W8-12) sign shall not be used on State highways. Whenever construction or maintenance work causes obliteration of center stripe, temporary or permanent center stripe shall be in place prior to opening the State highway to public traffic.

### **Section 6F.48 Reverse Curve Signs (W1-4 Series)**

Guidance:

<sup>01</sup> In order to give road users advance notice of a lane shift, a Reverse Curve (W1-4, ~~W1-4b, or W1-4e~~) sign (see Figure 6F-4) should be used when a lane (or lanes) is being shifted to the left or right. If the design speed of the curves is 30 mph or less, a Reverse Turn (W1-3) sign should be used.

Standard:

<sup>02</sup> If a Reverse Curve (or Turn) sign is used, the direction of the reverse curve (or turn) shall be appropriately illustrated. Except as provided in Paragraph 3, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users.

Option:

<sup>03</sup> Where two or more lanes are being shifted, a W1-4 (or W1-3) sign with an ALL LANES (W24-1cP) plaque (see Figure 6F-4) may be used instead of a sign that illustrates the number of lanes.

<sup>04</sup> Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.

### **Section 6F.49 Double Reverse Curve Signs (W24-1 Series)**

Option:

<sup>01</sup> The Double Reverse Curve (W24-1, ~~W24-1a, or W24-1b~~) sign (see Figure 6F-4) may be used where the tangent distance between two reverse curves is less than 600 feet, thus making it difficult for a second Reverse Curve (W1-4 series) sign to be placed between the curves. If the design speed of the curves is 30 mph or less, Double Reverse Turn signs should be used.

**Standard:**

**02 If a Double Reverse Curve (or Turn) sign is used, the direction of the double reverse curve (or turn) shall be appropriately illustrated. Except as provided in Paragraph 3, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users.**

**Option:**

03 Where two or more lanes are being shifted, a W24-1 (or Double Reverse Turn sign showing one lane) sign with an ALL LANES (W24-1cP) plaque (see Figure 6F-4) may be used instead of a sign that illustrates the number of lanes.

04 Where more than three lanes are being shifted, the Double Reverse Curve (or Turn) sign may be rectangular.

**Section 6F.50 Other Warning Signs**

**Option:**

01 Advance warning signs may be used by themselves or with other advance warning signs.

02 Besides the warning signs specifically related to TTC zones, several other warning signs in Part 2 may apply in TTC zones.

**Standard:**

**03 Except as provided in Section 6F.02, other warning signs that are used in TTC zones shall have black legends and borders on an orange background.**

**Section 6F.51 Special Warning Signs**

**Option:**

01 Special warning signs may be used based on engineering judgment.

**Guidance:**

02 *Special warning signs should comply with the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.*

**Section 6F.52 Advisory Speed Plaque (W13-1P)**

**Option:**

01 In combination with a warning sign, an Advisory Speed (W13-1P) plaque (see Figure 6F-4) may be used to indicate a recommended speed through the TTC zone.

**Standard:**

**02 The Advisory Speed plaque shall not be used in conjunction with any sign other than a warning sign, nor shall it be used alone. When used with orange TTC zone signs, this plaque shall have a black legend and border on an orange background. The sign shall be at least 24 x 24 inches in size when used with a sign that is 36 x 36 inches or larger. Except in emergencies, an Advisory Speed plaque shall not be mounted until the recommended speed is determined by the highway agency.**

**Section 6F.53 Supplementary Distance Plaque (W7-3aP)**

**Option:**

01 In combination with a warning sign, a Supplementary Distance (W7-3aP) plaque (see Figure 6F-4) with the legend NEXT XX MILES may be used to indicate the length of highway over which a work activity is being conducted, or over which a condition exists in the TTC zone.

02 In long TTC zones, Supplementary Distance plaques with the legend NEXT XX MILES may be placed in combination with warning signs at regular intervals within the zone to indicate the remaining length of highway over which the TTC work activity or condition exists.

02a *The XXX FT (C29(CA)) plaque may be used on the face of a warning sign to indicate the length of highway over which a work activity is being conducted, or over which a condition exists in the TTC zone.*

**Standard:**

**03 The Supplementary Distance plaque with the legend NEXT XX MILES shall not be used in conjunction with any sign other than a warning sign, nor shall it be used alone. When used with orange TTC zone signs, this plaque shall have a black legend and border on an orange background. The sign shall be at least 30 x 24 inches in size when used with a sign that is 36 x 36 inches or larger.**

*Guidance:*

*04 When used in TTC zones, the Supplementary Distance plaque with the legend NEXT XX MILES should be placed below the initial warning sign designating that, within the approaching zone, a temporary work activity or condition exists.*

### **Section 6F.54 Motorcycle Plaque (W8-15P)**

*Option:*

*01 A Motorcycle (W8-15P) plaque (see Figure 6F-4) may be mounted below a LOOSE GRAVEL (W8-7) sign, an UNEVEN LANES (W8-11) sign, a GROOVED PAVEMENT (W8-15) sign, a METAL BRIDGE DECK (W8-16) sign, or a STEEL PLATE AHEAD (W8-24) sign if the warning is intended to be directed primarily to motorcyclists.*

### **Section 6F.55 Guide Signs**

*Support:*

*01 Guide signs along highways provide road users with information to help them along their way through the TTC zone. The design of guide signs is presented in Part 2.*

*Guidance:*

- 02 The following guide signs should be used in TTC zones as needed:*
- A. Standard route markings, where temporary route changes are necessary,*
  - B. Directional signs and street name signs, and*
  - C. Special guide signs relating to the condition or work being done.*

**Standard:**

**03 If additional temporary guide signs are used in TTC zones, they shall have a black legend and border on an orange background.**

*Option:*

*04 Guide signs used in TTC incident management situations may have a black legend and border on a fluorescent pink background.*

*05 When directional signs and street name signs are used in conjunction with detour routing, these signs may have a black legend and border on an orange background.*

*06 When permanent directional signs or permanent street name signs are used in conjunction with detour signing, they may have a white legend on a green background.*

### **Section 6F.56 ROAD WORK NEXT XX MILES Sign (G20-1)**

*Guidance:*

*01 The ROAD WORK NEXT XX MILES (G20-1) sign (see Figure 6F-4) should be installed in advance of TTC zones that are more than 2 miles in length.*

*Option:*

*02 The ROAD WORK NEXT XX MILES sign may be mounted on a Type 3 Barricade. The sign may also be used for TTC zones of shorter length.*

**Standard:**

**03 The distance displayed on the ROAD WORK NEXT XX MILES sign shall be stated to the nearest whole mile.**

*Option:*

- 04 The word STATE HIGHWAY may be substituted for ROAD, where applicable.*
- 05 The word CONSTRUCTION may be substituted for WORK, where applicable.*

### **Section 6F.57 END ROAD WORK Sign (G20-2)**

*Guidance:*

*01 When used, the END ROAD WORK (G20-2) sign (see Figure 6F-4) should be placed near the downstream end of the termination area, as determined by engineering judgment.*

**Option:**

02 The END ROAD WORK sign may be installed on the back of a warning sign facing the opposite direction of road users or on the back of a Type 3 Barricade.

03 The END ROAD WORK (G20-2) sign may be omitted if the end of the work zone is obvious to motorists or falls within a larger project's limits.

**Support:**

04 Conditions could be such that posting of END ROAD WORK (G20-2) signs is not helpful. For example, they can be omitted if other TTC zones begin within 1 mile of the end of the workspace in rural areas, or about 0.25 mile within urban areas. For normal daytime maintenance operations, the G20-2 sign is optional.

**Section 6F.58 PILOT CAR FOLLOW ME Sign (G20-4)**

**Standard:**

01 **The PILOT CAR FOLLOW ME (G20-4) sign (see Figure 6F-4) shall be mounted in a conspicuous position on the rear of a vehicle used for guiding one-way vehicular traffic through or around a TTC zone (see Section 6C.13).**

**Guidance:**

02 *The TRAFFIC CONTROL – WAIT AND FOLLOW PILOT CAR (C37(CA)) sign should be used at intersecting approaches to a work zone when pilot cars are controlling reversible lane traffic. Where vehicular traffic cannot effectively self-regulate, one or two flaggers should be placed at the intersection instead of C37(CA) sign.*

**Section 6F.59 Detour Signs (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-9c, and M4-10)**

**Standard:**

01 **Each detour shall be adequately marked with standard temporary route signs and destination signs.**

**Option:**

02 Detour signs in TTC incident management situations may have a black legend and border on a fluorescent pink background.

03 The Detour Arrow (M4-10) sign (see Figure 6F-5) may be used where a detour route has been established.

04 The DETOUR (M4-8) sign (see Figure 6F-5) may be mounted at the top of a route sign assembly to mark a temporary route that detours from a highway, bypasses a section closed by a TTC zone, and rejoins the highway beyond the TTC zone.

**Guidance:**

05 *The Detour Arrow (M4-10) sign should normally be mounted just below the ROAD CLOSED (R11-2, R11-3a, or R11-4) sign. The Detour Arrow sign should include a horizontal arrow pointed to the right or left as required.*

06 *The DETOUR (M4-9) sign (see Figure 6F-5) should be used for unnumbered highways, for emergency situations, for periods of short durations, or where, over relatively short distances, road users are guided along the detour and back to the desired highway without route signs.*

07 *A Street Name sign should be placed above, or the street name should be incorporated into, a DETOUR (M4-9) sign to indicate the name of the street being detoured.*

**Option:**

08 The END DETOUR (M4-8a) or END (M4-8b) sign (see Figure 6F-5) may be used to indicate that the detour has ended.

**Guidance:**

09 *When the END DETOUR sign is used on a numbered highway, the sign should be mounted above a route sign after the downstream end of the detour.*

10 *The Pedestrian/Bicycle Detour (M4-9a) sign (see Figure 6F-5) should be used where a pedestrian/bicycle detour route has been established because of the closing of a pedestrian/bicycle facility to through traffic.*

**Standard:**

11 **If used, the Pedestrian/Bicycle Detour sign shall have an arrow pointing in the appropriate direction.**

**Option:**

12 The arrow on a Pedestrian/Bicycle Detour sign may be on the sign face or on a supplemental plaque.

13 The Pedestrian Detour (M4-9b) sign or Bicycle Detour (M4-9c) sign (see Figure 6F-5) may be used where a pedestrian or bicycle detour route (not both) has been established because of the closing of the pedestrian or bicycle facility to through traffic.

*Guidance:*

14 *The DETOUR (M4-8) sign should be placed on tangent sections at intervals not to exceed 1300 feet and at major intersections.*

*Option:*

15 In urban areas, the M4-8 signs may be placed at every intersection.

*Guidance:*

16 *The DETOUR with Arrow (SC3(CA)) sign should be used for unnumbered highways, for emergency situations, for periods of short duration, or where, over relatively short distances, road users are guided along the detour and back to the desired highway without route markers.*

17 *The (FWY) DETOUR with Arrow (SC9(CA)) sign should be used to inform motorists of the direction to follow for a detour. The words FWY DETOUR may be substituted for DETOUR, where applicable.*

## **Section 6F.60 Portable Changeable Message Signs**

**Support:**

01 Portable changeable message signs (PCMS) are TTC devices installed for temporary use with the flexibility to display a variety of messages. In most cases, portable changeable message signs follow the same provisions for design and application as those given for changeable message signs in Chapter 2L. The information in this Section describes situations where the provisions for portable changeable message signs differ from those given in Chapter 2L.

02 Portable changeable message signs are used most frequently on high-density urban freeways, but have applications on all types of highways where highway alignment, road user routing problems, or other pertinent conditions require advance warning and information.

03 Portable changeable message signs have a wide variety of applications in TTC zones including: roadway, lane, or ramp closures; incident management; width restriction information; speed control or reductions; advisories on work scheduling; road user management and diversion; warning of adverse conditions or special events; and other operational control.

04 The primary purpose of portable changeable message signs in TTC zones is to advise the road user of unexpected situations. Portable changeable message signs are particularly useful as they are capable of:

- A. Conveying complex messages,
- B. Displaying real time information about conditions ahead, and
- C. Providing information to assist road users in making decisions prior to the point where actions must be taken.

05 Some typical applications include the following:

- A. Where the speed of vehicular traffic is expected to drop substantially;
- B. Where significant queuing and delays are expected;
- C. Where adverse environmental conditions are present;
- D. Where there are changes in alignment or surface conditions;
- E. Where advance notice of ramp, lane, or roadway closures is needed;
- F. Where crash or incident management is needed; and/or
- G. Where changes in the road user pattern occur.

*Guidance:*

06 *The components of a portable changeable message sign should include: a message sign, control systems, a power source, and mounting and transporting equipment. The front face of the sign should be covered with a protective material.*

**Standard:**

07 **Portable changeable message signs shall comply with the applicable design and application principles established in Chapter 2A. Portable changeable message signs shall display only traffic operational, regulatory, warning, and guidance information, and shall not be used for advertising messages.**

**Support:**

<sup>08</sup> Section 2L.02 contains information regarding overly simplistic or vague messages that is also applicable to portable changeable message signs.

**Standard:**

<sup>09</sup> **The colors used for legends on portable changeable message signs shall comply with those shown in Table 2A-5 2A-5(CA).**

**Support:**

<sup>10</sup> Section 2L.04 contains information regarding the luminance, luminance contrast, and contrast orientation that is also applicable to portable changeable message signs.

**Guidance:**

<sup>11</sup> *Portable changeable message signs should be visible from 1/2 mile under both day and night conditions.*

**Support:**

<sup>12</sup> Section 2B.13 contains information regarding the design of portable changeable message signs that are used to display speed limits that change based on operational conditions, or are used to display the speed at which approaching drivers are traveling.

**Guidance:**

<sup>13</sup> *A portable changeable message sign should be limited to three lines of eight characters per line or should consist of a full matrix display.*

<sup>14</sup> *Except as provided in Paragraph 15, the letter height used for portable changeable message sign messages should be a minimum of 18 inches.*

**Option:**

<sup>15</sup> For portable changeable message signs mounted on service patrol trucks or other incident response vehicles, a letter height as short as 10 inches may be used. Shorter letter sizes may also be used on a portable changeable message sign used on low speed facilities provided that the message is legible from at least 650 feet.

<sup>16</sup> The portable changeable message sign may vary in size.

**Guidance:**

<sup>17</sup> *Messages on a portable changeable message sign should consist of no more than two phases, and a phase should consist of no more than three lines of text. Each phase should be capable of being understood by itself, regardless of the order in which it is read. Messages should be centered within each line of legend. If more than one portable changeable message sign is simultaneously legible to road users, then only one of the signs should display a sequential message at any given time.*

**Support:**

<sup>18</sup> Road users have difficulties in reading messages displayed in more than two phases on a typical three-line portable changeable message sign.

**Standard:**

<sup>19</sup> **Techniques of message display such as animation, rapid flashing, dissolving, exploding, scrolling, travelling horizontally or vertically across the face of the sign, or other dynamic elements shall not be used.**

**Guidance:**

<sup>20</sup> *When a message is divided into two phases, the display time for each phase should be at least 2 seconds, and the sum of the display times for both of the phases should be a maximum of 8 seconds.*

<sup>21</sup> *All messages should be designed with consideration given to the principles provided in this Section and also taking into account the following:*

*A. The message should be as brief as possible and should contain three thoughts (with each thought preferably shown on its own line) that convey:*

- 1. The problem or situation that the road user will encounter ahead,*
- 2. The location of or distance to the problem or situation, and*
- 3. The recommended driver action.*

*B. If more than two phases are needed to display a message, additional portable changeable message signs should be used. When multiple portable changeable message signs are needed, they should be placed on the same side of the roadway and they should be separated from each other by a distance of at least 1,000 feet on freeways and expressways, and by a distance of at least 500 feet on other types of highways.*

**Standard:**

**22 When the word messages shown in Tables 1A-1 or 1A-2 need to be abbreviated on a portable changeable message sign, the provisions described in Section 1A.15 shall be followed.**

**23 In order to maintain legibility, portable changeable message signs shall automatically adjust their brightness under varying light conditions.**

**24 The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable.**

**25 Portable changeable message signs shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs.**

**26 The mounting of portable changeable message signs on a trailer, a large truck, or a service patrol truck shall be such that the bottom of the message sign shall be a minimum of 7 feet above the roadway in urban areas and 5 feet above the roadway in rural areas when it is in the operating mode.**

*Guidance:*

*27 Portable changeable message signs should be used as a supplement to and not as a substitute for conventional signs and pavement markings.*

*28 When portable changeable message signs are used for route diversion, they should be placed far enough in advance of the diversion to allow road users ample opportunity to perform necessary lane changes, to adjust their speed, or to exit the affected highway.*

*29 Portable changeable message signs should be sited and aligned to provide maximum legibility and to allow time for road users to respond appropriately to the portable changeable message sign message.*

*30 Portable changeable message signs should be placed off the shoulder of the roadway and behind a traffic barrier, if practical. Where a traffic barrier is not available to shield the portable changeable message sign, it should be placed off the shoulder and outside of the clear zone. If a portable changeable message sign has to be placed on the shoulder of the roadway or within the clear zone, it should be delineated with retroreflective TTC devices.*

*31 When portable changeable message signs are used in TTC zones, they should display only TTC messages.*

*32 When portable changeable message signs are not being used to display TTC messages, they should be relocated such that they are outside of the clear zone or shielded behind a traffic barrier and turned away from traffic. If relocation or shielding is not practical, they should be delineated with retroreflective TTC devices.*

*33 Portable changeable message sign trailers should be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the trailer as seen by oncoming road users. If the sign trailer is located within 15 feet of the edge of the traveled way, it should be delineated with a taper consisting of 9 cones placed at a spacing of 25 feet apart.*

**Standard:**

**34 On State highways, the message displayed on Portable Changeable Message signs shall be visible from a distance of 1500 feet and shall be legible from a distance of 750 feet, at noon on a cloudless day, by persons with vision of or corrected to 20/20.**

*Guidance:*

*35 On local roads, the message displayed on Portable Changeable Message signs should be visible from a distance of 1500 feet and shall be legible from a distance of 750 feet, at noon on a cloudless day, by persons with vision of or corrected to 20/20.*

*Support:*

*36 Refer to Department of Transportation's Standard Specifications Section 12-3.12 for visibility criteria cited. See Section 1A.11 for information regarding this publication.*

*37 Refer to Section 2B.13 for Vehicle Speed Feedback Signs.*

**Section 6F.61 Arrow Boards**

**Standard:**

**01 An arrow board shall be a sign with a matrix of elements capable of either flashing or sequential displays. This sign shall provide additional warning and directional information to assist in merging and controlling road users through or around a TTC zone.**

*Guidance:*

*02 An arrow board in the arrow or chevron mode should be used to advise approaching traffic of a lane closure along major multi-lane roadways in situations involving heavy traffic volumes, high speeds, and/or limited sight distances, or at other locations and under other conditions where road users are less likely to expect such lane closures.*

*03 If used, an arrow board should be used in combination with appropriate signs, channelizing devices, or other TTC devices.*

*04 An arrow board should be placed on the shoulder of the roadway or, if practical, farther from the traveled lane. It should be delineated with retroreflective TTC devices. When an arrow board is not being used, it should be removed; if not removed, it should be shielded; or if the previous two options are not feasible, it should be delineated with retroreflective TTC devices.*

**Standard:**

**05 Arrow boards shall meet the minimum size, legibility distance, number of elements, and other specifications shown in Figure 6F-6.**

**Support:**

06 Type A arrow boards are appropriate for use on low-speed urban streets. Type B or II arrow boards are appropriate for intermediate-speed facilities and for maintenance or mobile operations on high-speed roadways. Type C or I arrow boards are intended to be used on high-speed, high-volume motor vehicle traffic control projects. Type D arrow boards are intended for use on vehicles authorized by the State or local agency.

**Standard:**

**07 Type A, B or II, and C or I arrow boards shall have solid rectangular appearances. A Type D arrow board shall conform to the shape of the arrow.**

**08 All arrow boards shall be finished in non-reflective black. The arrow board shall be mounted on a vehicle, a trailer, or other suitable support.**

*Guidance:*

*09 The minimum mounting height, measured vertically from the bottom of the board to the roadway below it or to the elevation of the near edge of the roadway, of an arrow board should be 7 feet, except on vehicle-mounted arrow boards, which should be as high as practical.*

*10 A vehicle-mounted arrow board should be provided with remote controls.*

**Standard:**

**11 Arrow board elements shall be capable of at least a 50 percent dimming from full brilliance. The dimmed mode shall be used for nighttime operation of arrow boards.**

*Guidance:*

*12 Full brilliance should be used for daytime operation of arrow boards.*

**Standard:**

**13 The arrow board shall have suitable elements capable of the various operating modes. The color presented by the elements shall be yellow.**

*Guidance:*

*14 If an arrow board consisting of a bulb matrix is used, the elements should be recess-mounted or equipped with an upper hood of not less than 180 degrees.*

**Standard:**

**15 The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 or more than 40 flashes per minute.**

**16 An arrow board shall have the following three mode selections:**

- A. A Flashing Arrow, Sequential Arrow, or Sequential Chevron mode;**
- B. A flashing Double Arrow mode; and**
- C. A flashing Caution or Alternating Diamond mode.**

**17 An arrow board in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.**

**18 For shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway, an arrow board shall be used only in the caution mode.**

*Guidance:*

<sup>19</sup> For a stationary lane closure, the arrow board should be located on the shoulder at the beginning of the merging taper.

<sup>20</sup> Where the shoulder is narrow, the arrow board should be located in the closed lane.

**Standard:**

<sup>21</sup> **When arrow boards are used to close multiple lanes, a separate arrow board shall be used for each closed lane.**

*Guidance:*

<sup>22</sup> When arrow boards are used to close multiple lanes, if the first arrow board is placed on the shoulder, the second arrow board should be placed in the first closed lane at the upstream end of the second merging taper (see Figure 6H-37). When the first arrow board is placed in the first closed lane, the second arrow board should be placed in the second closed lane at the downstream end of the second merging taper.

<sup>23</sup> For mobile operations where a lane is closed, the arrow board should be located to provide adequate separation from the work operation to allow for appropriate reaction by approaching drivers.

**Standard:**

<sup>24</sup> **A vehicle displaying an arrow board shall be equipped with high-intensity rotating, flashing, oscillating, or strobe lights.**

<sup>25</sup> **Arrow boards shall only be used to indicate a lane closure. Arrow boards shall not be used to indicate a lane shift.**

*Option:*

<sup>26</sup> A portable changeable message sign may be used to simulate an arrow board display.

**Standard:**

<sup>27</sup> **The arrow board shall be located behind channelizing devices used to transition traffic from the closed lane.**

*Support:*

<sup>28</sup> Department of Transportation's Standard Specifications for flashing arrow boards are in Section 12-3.03. See Section 1A.11 for information regarding this publication.

**Standard:**

<sup>29</sup> **The minimum legibility distance is the distance at which flashing arrow boards shall be legible at noon on a cloudless day and at night by persons with vision of or corrected to 20/20.**

*Support:*

<sup>30</sup> The minimum legibility distance for each arrow board type is shown in Figure 6F-6.

<sup>31</sup> Refer to Department of Transportation's Standard Specifications Section 12-3.03 for visibility criteria cited. See Section 1A.11 for information regarding this publication.

## **Section 6F.62 High-Level Warning Devices (Flag Trees)**

*Option:*

<sup>01</sup> A high-level warning device (flag tree) may supplement other TTC devices in TTC zones.

*Support:*

<sup>02</sup> A high-level warning device is designed to be seen over the top of typical passenger cars. A typical high-level warning device is shown in Figure 6F-2.

**Standard:**

<sup>03</sup> **A high-level warning device shall consist of a minimum of two flags with or without a Type B high-intensity flashing warning light. The distance from the roadway to the bottom of the lens of the light and to the lowest point of the flag material shall be not less than 8 feet. The flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color.**

*Option:*

<sup>04</sup> An appropriate warning sign may be mounted below the flags.

*Support:*

<sup>05</sup> High-level warning devices are most commonly used in high-density road user situations to warn road users of short-term operations.

## Section 6F.63 Channelizing Devices

### Standard:

**01 Designs of various channelizing devices shall be as shown in Figure 6F-7 and 6F-102(CA). All channelizing devices shall be crashworthy.**

### Support:

**02** The function of channelizing devices is to warn road users of conditions created by work activities in or near the roadway and to guide road users. Channelizing devices include cones, tubular markers, [channelizers \(CA\)](#), [portable delineators](#), vertical panels, drums, barricades, and longitudinal channelizing devices.

**03** Channelizing devices provide for smooth and gradual vehicular traffic flow from one lane to another, onto a bypass or detour, or into a narrower traveled way. They are also used to channelize vehicular traffic away from the work space, pavement drop-offs, pedestrian or shared-use paths, or opposing directions of vehicular traffic.

### Standard:

**04 Devices used to channelize pedestrians shall be detectable to users of long canes and visible to persons having low vision.**

**05 Where channelizing devices are used to channelize pedestrians, there shall be continuous detectable bottom and top surfaces to be detectable to users of long canes. The bottom of the bottom surface shall be no higher than 2 inches above the ground. The top of the top surface shall be no lower than 32 inches above the ground.**

### Option:

**06** A gap not exceeding 2 inches between the bottom rail and the ground surface may be used to facilitate drainage.

### Guidance:

**07** *Where multiple channelizing devices are aligned to form a continuous pedestrian channelizer, connection points should be smooth to optimize long-cane and hand trailing.*

**08** *The spacing between cones, tubular markers, vertical panels, drums, and barricades should not exceed a distance in feet equal to 1.0 times the speed limit in mph when used for taper channelization, and a distance in feet equal to 2.0 times the speed limit in mph when used for tangent channelization.*

**09** *When channelizing devices have the potential of leading vehicular traffic out of the intended vehicular traffic space as shown in Figure 6H-39, the channelizing devices should be extended a distance in feet of 2.0 times the speed limit in mph beyond the downstream end of the transition area.*

**09a** *The spacing of channelizing devices should not exceed the maximum distances shown in Table 6F-101(CA).*

### Option:

**10** Warning lights (see Section 6F.83) may be added to channelizing devices in areas with frequent fog, snow, or severe roadway curvature, or where visual distractions are present.

### Standard:

**11 Warning lights shall flash when placed on channelizing devices used alone or in a cluster to warn of a condition. Except for the sequential flashing warning lights discussed in Paragraphs 12 and 13, warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.**

### Option:

**12** A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.

### Standard:

**13 When used, the successive flashing of the sequential warning lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55 nor more than 75 times per minute.**

**14 The retroreflective material used on channelizing devices shall have a smooth, sealed outer surface that will display a similar color day or night.**

### Option:

**15** The name and telephone number of the highway agency, contractor, or supplier may be displayed on the non-retroreflective surface of all types of channelizing devices.

**Standard:**

**16 The letters and numbers of the name and telephone number shall be non-retroreflective and not over 2 inches in height.**

*Guidance:*

*17 Particular attention should be given to maintaining the channelizing devices to keep them clean, visible, and properly positioned at all times.*

**Standard:**

**18 Devices that are damaged or have lost a significant amount of their retroreflectivity and effectiveness shall be replaced.**

**Section 6F.64 Cones**

**Standard:**

**01 Cones (see Figure 6F-7) shall be predominantly orange and shall be made of a material that can be struck without causing damage to the impacting vehicle. For daytime and low-speed roadways, cones shall be not less than 18 inches in height. When cones are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, cones shall be a minimum of 28 inches in height.**

**02 For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of cones that are 28 to 36 inches in height shall be provided by a 6-inch wide white band located 3 to 4 inches from the top of the cone and an additional 4-inch wide white band located approximately 2 inches below the 6-inch band.**

**03 Retroreflectorization of cones that are more than 36 inches in height shall be provided by horizontal, circumferential, alternating orange and white retroreflective stripes that are 4 to 6 inches wide. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflective spaces between the orange and white stripes shall not exceed 3 inches in width.**

*Support:*

*03a The 36 inch and 42 inch high cones provide additional conspicuity in visually complex environments and for older road users.*

*Option:*

*04 Traffic cones may be used to channelize road users, divide opposing vehicular traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short duration maintenance and utility work.*

*Guidance:*

*05 Steps should be taken to minimize the possibility of cones being blown over or displaced by wind or moving vehicular traffic.*

*Option:*

*06 Cones may be doubled up to increase their weight.*

*Support:*

*07 Some cones are constructed with bases that can be filled with ballast. Others have specially weighted bases, or weight such as sandbag rings that can be dropped over the cones and onto the base to provide added stability.*

*Guidance:*

*08 Ballast should be kept to the minimum amount needed.*

*Option:*

*09 Retroreflectorization of 28 inch or larger cones may be provided by a 13 inch band (sleeve).*

**Standard:**

**10 On State highways, the retroreflectorized bands shall be visible at 1000 feet at night under illumination of legal high beam headlights, by persons with vision of or corrected to 20/20.**

*Guidance:*

*11 On local roads, the retroreflectorized bands should be visible at 1000 feet at night under illumination of legal high beam headlights, by persons with vision of or corrected to 20/20.*

*Support:*

*12 Refer to Department of Transportation's Standard Specifications Section 12-3.01A(4) for visibility criteria cited. See Section 1A.11 for information regarding this publication.*

## Section 6F.65 Tubular Markers

### Standard:

**01 Tubular markers (see Figure 6F-7) shall be predominantly orange and shall be not less than 18 inches high and 2 inches wide facing road users. They shall be made of a material that can be struck without causing damage to the impacting vehicle.**

**02 Tubular markers shall be a minimum of 28 inches in height when they are used on freeways and other high-speed highways, on all highways during nighttime, or whenever more conspicuous guidance is needed.**

**03 For nighttime use, tubular markers shall be retroreflectorized. Retroreflectorization of tubular markers that have a height of less than 42 inches shall be provided by two 3-inch wide white bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands. Retroreflectorization of tubular markers that have a height of 42 inches or more shall be provided by four 4- to 6-inch wide alternating orange and white stripes with the top stripe being orange.**

### Support:

**03a** The 42 inch high tubular markers provide additional conspicuity in visually complex environments and for older road users.

**03b** Cylindrical tubular markers that are fixed (cemented) to the pavement are commonly referred to as tubular markers. Non-cylindrical tubular markers are commonly referred to as channelizers (CA). Tubular markers that are not fixed to the pavement but stabilized by using weighted bases are commonly referred to as portable delineators.

### Standard:

**03c** The design of a portable delineator shall be as shown in Figure 6F-102(CA).

**03d** Portable delineators shall be a minimum of 36 inches in height. The vertical portion of portable delineators shall be fluorescent orange or predominantly orange. The posts shall be not less than 3 inches in width or diameter. A minimum of 2 white retroreflective bands, each not less than 3 inches wide, shall be mounted at a minimum of 1-1/2 inches apart. The lower retroreflective band shall be from 2.5 to 3 feet above the roadway surface.

### Guidance:

**04** Tubular markers have less visible area than other devices and should be used only where space restrictions do not allow for the use of other more visible devices.

**05** Tubular markers should be stabilized by affixing them to the pavement, by using weighted bases, or weights such as sandbag rings that can be dropped over the tubular markers and onto the base to provide added stability. Ballast should be kept to the minimum amount needed.

### Option:

**06** Tubular markers may be used effectively to divide opposing lanes of road users, divide vehicular traffic lanes when two or more lanes of moving vehicular traffic are kept open in the same direction, and to delineate the edge of a pavement drop off where space limitations do not allow the use of larger devices.

### Standard:

**07** A tubular marker shall be attached to the pavement to display the minimum 2-inch width to the approaching road users.

**08** When a non-cylindrical tubular marker or a channelizer (CA) is used, it shall be attached to the pavement in a manner such that the retroreflectorized bands facing road users meet the minimum visibility requirements.

**09** The design of a channelizer (CA) shall be as shown in Figure 6F-102(CA). The height shall be 36 inch minimum where speeds are above 40 mph. The height shall be 28 inch minimum where speeds are 40 mph or less. The width of the post shall be 2 ¼ inch minimum and the color predominantly orange. channelizers (CA) shall be affixed with retroreflective white sheeting, 3 by 12 inches in size.

### Support:

**10** One kind of non-cylindrical tubular marker is called a "channelizer (CA)", see Figure 6F-102(CA). This channelizer (CA) is not to be confused with the term "channelizing device(s)" in Section 6F.63.

**11** Channelizers (CA) are implanted in the ground or affixed to the pavement, and are not susceptible to displacement, and are capable of normally withstanding numerous vehicular impacts.

**12** Channelizers (CA) are generally used in series to create a visual fence/barrier, to provide additional guidance and/or restriction to traffic.

Option:

<sup>13</sup> Channelizers (CA) may be used in lieu of cones, portable delineators, or drums, to channelize traffic or divide opposing lanes of traffic.

**Standard:**

<sup>14</sup> **On State highways, the retroreflectorized bands for tubular markers, portable delineators, and channelizers (CA) shall be visible at 1000 feet during night under illumination of legal high beam headlights, by persons with vision of or corrected to 20/20.**

Guidance:

<sup>15</sup> On local roads, the retroreflectorized bands for tubular markers, portable delineators, and channelizers (CA) should be visible at 1000 feet at night under illumination of legal high beam headlights, by persons with vision of or corrected to 20/20.

Support:

<sup>16</sup> Refer to Department of Transportation's Standard Specifications Section 12-3.01A(4) for visibility criteria cited. See Section 1A.11 for information regarding this publication.

<sup>17</sup> Refer Chapter 3H for other details and requirements of channelizers (CA).

### **Section 6F.66 Vertical Panels**

**Standard:**

<sup>01</sup> **Vertical panels (see Figure 6F-7) shall have retroreflective striped material that is 8 to 12 inches in width and at least 24 inches in height. They shall have alternating diagonal orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass.**

<sup>02</sup> **Where the height of the retroreflective material on the vertical panel is 36 inches or more, a stripe width of 6 inches shall be used.**

Guidance:

<sup>02a</sup> *Vertical panels should be a minimum of 12 inch in width.*

Option:

<sup>03</sup> Where the height of the retroreflective material on the vertical panel is less than 36 inches, a stripe width of 4 inches may be used.

<sup>04</sup> Where space is limited, vertical panels may be used to channelize vehicular traffic, divide opposing lanes, or replace barricades.

### **Section 6F.67 Drums**

**Standard:**

<sup>01</sup> **Drums (see Figure 6F-7) used for road user warning or channelization shall be constructed of lightweight, deformable materials. They shall be a minimum of 36 inches in height and have at least an 18-inch minimum width regardless of orientation. Metal drums shall not be used. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 4 to 6 inches wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any non-retroreflectorized spaces between the horizontal orange and white stripes shall not exceed 3 inches wide. Drums shall have closed tops that will not allow collection of construction debris or other debris.**

Support:

<sup>02</sup> Drums are highly visible, have good target value, give the appearance of being formidable obstacles and, therefore, command the respect of road users. They are portable enough to be shifted from place to place within a TTC zone in order to accommodate changing conditions, but are generally used in situations where they will remain in place for a prolonged period of time.

Option:

<sup>03</sup> Although drums are most commonly used to channelize or delineate road user flow, they may also be used alone or in groups to mark specific locations.

*Guidance:*

*04 Drums should not be weighted with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. Drums used in regions susceptible to freezing should have drain holes in the bottom so that water will not accumulate and freeze causing a hazard if struck by a road user.*

**Standard:**

**05 Ballast shall not be placed on the top of a drum.**

**06 On State highways, the retroreflectorized bands shall be maintained at or above minimum levels in Table 2A-3.**

*Guidance:*

*07 On local roads, the retroreflectorized bands should be maintained at or above minimum levels in Table 2A-3.*

**Support:**

**08 Refer to Department of Transportation's Standard Specifications Section 12-3.01A(4) for visibility criteria cited. See Section 1A.11 for information regarding this publication.**

**Section 6F.68 Type 1, 2, or 3 Barricades**

**Support:**

**01 A barricade is a portable or fixed device having from one to three rails with appropriate markings and is used to control road users by closing, restricting, or delineating all or a portion of the right-of-way.**

**02 As shown in Figure 6F-7, barricades are classified as Type 1, Type 2, or Type 3.**

**Standard:**

**03 Stripes on barricade rails shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Except as provided in Paragraph 4, the stripes shall be 6 inches wide.**

**Option:**

**04 When rail lengths are less than 36 inches, 4-inch wide stripes may be used.**

**Standard:**

**05 The minimum length for Type 1 and Type 2 Barricades shall be 24 inches, and the minimum length for Type 3 Barricades shall be 48 inches. Each barricade rail shall be 8 to 12 inches wide. Barricades used on freeways, expressways, and other high-speed roadways shall have a minimum of 270 square inches of retroreflective area facing road users.**

**Support:**

**05a The Type I and Type II Barricades, 36 inch in length with each rail 12 inch wide, provide additional conspicuity in visually complex environments and for older road users.**

**Standard:**

**05b On State highways, the retroreflectorized bands shall be maintained at or above minimum levels in Table 2A-3.**

*Guidance:*

*05c On local roads, the retroreflectorized bands should be maintained at or above minimum levels in Table 2A-3.*

**Support:**

**05d Refer to Department of Transportation's Standard Specifications Section 12-3.01A(4) for visibility criteria cited. See Section 1A.11 for information regarding this publication.**

*Guidance:*

*06 Where barricades extend entirely across a roadway, the stripes should slope downward in the direction toward which road users must turn.*

*07 Where both right and left turns are provided, the barricade stripes should slope downward in both directions from the center of the barricade or barricades.*

*08 Where no turns are intended, the stripes should be positioned to slope downward toward the center of the barricade or barricades.*

*09 Barricade rails should be supported in a manner that will allow them to be seen by the road user, and in a manner that provides a stable support that is not easily blown over or displaced.*

*10 The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width*

*of 60 inches throughout the entire length of the pedestrian pathway, a 60 x 60-inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.*

*<sup>11</sup> Barricade rail supports should not project into pedestrian circulation routes more than 4 inches from the support between 27 and 80 inches from the surface as described in Section 4.4.1 of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11).*

Option:

<sup>12</sup> For Type 1 Barricades, the support may include other unstriped horizontal rails necessary to provide stability.

Guidance:

*<sup>13</sup> On high-speed expressways or in other situations where barricades may be susceptible to overturning in the wind, ballasting should be used.*

Option:

<sup>14</sup> Sandbags may be placed on the lower parts of the frame or the stays of barricades to provide the required ballast.

Support:

<sup>15</sup> Type 1 or Type 2 Barricades are intended for use in situations where road user flow is maintained through the TTC zone.

Option:

<sup>16</sup> Barricades may be used alone or in groups to mark a specific condition or they may be used in a series for channelizing road users.

<sup>17</sup> Type 1 Barricades may be used on conventional roads or urban streets.

Guidance:

*<sup>18</sup> Type 2 or Type 3 Barricades should be used on freeways and expressways or other high-speed roadways. Type 3 Barricades should be used to close or partially close a road.*

Option:

<sup>19</sup> Type 3 Barricades used at a road closure may be placed completely across a roadway or from curb to curb.

Guidance:

*<sup>20</sup> Where provision is made for access of authorized equipment and vehicles, the responsibility for Type 3 Barricades should be assigned to a person who will provide proper closure at the end of each work day.*

Support:

<sup>21</sup> When a highway is legally closed but access must still be allowed for local road users, barricades usually are not extended completely across the roadway.

**Standard:**

**<sup>22</sup> A sign shall be installed with the appropriate legend concerning permissible use by local road users (see Section 6F.09). Adequate visibility of the barricades from both directions shall be provided.**

Option:

<sup>23</sup> Signs may be installed on barricades (see Section 6F.03).

<sup>24</sup> Type III barricades may be used as sign supports if the barricades have been successfully crash tested as one unit with a construction area sign attached.

## **Section 6F.69 Direction Indicator Barricades**

**Standard:**

**<sup>01</sup> The Direction Indicator Barricade (see Figure 6F-7) shall consist of a One-Direction Large Arrow (W1-6) sign mounted above a diagonal striped, horizontally aligned, retroreflective rail.**

**<sup>02</sup> The One-Direction Large Arrow (W1-6) sign shall be black on an orange background. The stripes on the bottom rail shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. The stripes shall be 4 inches wide. The One-Direction Large Arrow (W1-6) sign shall be 24 x 12 inches. The bottom rail shall have a length of 24 inches and a height of 8 inches.**

Option:

<sup>03</sup> The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.

*Guidance:*

*04 If used, Direction Indicator Barricades should be used in series to direct the driver through the transition and into the intended travel lane.*

### **Section 6F.70 Temporary Traffic Barriers as Channelizing Devices**

**Support:**

01 Temporary traffic barriers are not TTC devices in themselves; however, when placed in a position identical to a line of channelizing devices and marked and/or equipped with appropriate channelization features to provide guidance and warning both day and night, they serve as TTC devices.

**Standard:**

02 **Temporary traffic barriers serving as TTC devices shall comply with requirements for such devices as set forth throughout Part 6.**

03 **Temporary traffic barriers (see Section 6F.85) shall not be used solely to channelize road users, but also to protect the work space. If used to channelize vehicular traffic, the temporary traffic barrier shall be supplemented with delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility.**

*Guidance:*

*04 Temporary traffic barriers should not be used for a merging taper except in low-speed urban areas.*

*05 When it is necessary to use a temporary traffic barrier for a merging taper in low-speed urban areas or for a constricted/restricted TTC zone, the taper length should be designed to optimize road user operations considering the available geometric conditions.*

**Standard:**

06 **When it is necessary to use a temporary traffic barrier for a merging taper in low-speed urban areas or for a constricted/restricted TTC zone, the taper shall be delineated.**

*Guidance:*

*07 When used for channelization, temporary traffic barriers should be of a light color for increased visibility.*

**Option:**

08 Side reflectors with cube-corner lenses or top mounted reflectors (facing the driver) may be used on temporary traffic barriers.

*Guidance:*

*09 If used, the spacing of these reflectors should not exceed a distance in feet equal to 1.0 times the speed limit in mph through the TTC zone.*

### **Section 6F.71 Longitudinal Channelizing Devices**

**Support:**

01 Longitudinal channelizing devices are lightweight, deformable devices that are highly visible, have good target value, and can be connected together.

**Standard:**

02 **If used singly as Type 1, 2, or 3 barricades, longitudinal channelizing devices shall comply with the general size, color, stripe pattern, retroreflectivity, and placement characteristics established for the devices described in this Chapter.**

*Guidance:*

*03 If used to channelize vehicular traffic at night, longitudinal channelizing devices should be supplemented with retroreflective material or delineation for improved nighttime visibility.*

**Option:**

04 Longitudinal channelizing devices may be used instead of a line of cones, drums, or barricades.

05 Longitudinal channelizing devices may be hollow and filled with water as a ballast.

06 Longitudinal channelizing devices may be used for pedestrian traffic control.

**Standard:**

07 **If used for pedestrian traffic control, longitudinal channelizing devices shall be interlocked to delineate or channelize flow. The interlocking devices shall not have gaps that allow pedestrians to stray from the channelizing path.**

*Guidance:*

*08 Longitudinal channelizing devices have not met the crashworthy requirements for temporary traffic barriers and should not be used to shield obstacles or provide positive protection for pedestrians or workers.*

**Section 6F.72 Temporary Lane Separators**

**Option:**

*01 Temporary lane separators may be used to channelize road users, to divide opposing vehicular traffic lanes, to divide lanes when two or more lanes are open in the same direction, and to provide continuous pedestrian channelization.*

**Standard:**

**02 Temporary lane separators shall be crashworthy. Temporary lane separators shall have a maximum height of 4 inches and a maximum width of 1 foot, and shall have sloping sides in order to facilitate crossover by emergency vehicles.**

**Option:**

*03 Temporary lane separators may be supplemented with any of the approved channelizing devices contained in this Chapter, such as tubular markers, vertical panels, and opposing traffic lane dividers.*

**Standard:**

**04 If appropriate channelizing devices are used to supplement a temporary lane separator, the channelizing devices shall be retroreflectorized to provide nighttime visibility. If channelizing devices are not used, the temporary lane separator shall contain retroreflectorization to enhance its visibility.**

*Guidance:*

*05 A temporary lane separator should be stabilized by affixing it to the pavement in a manner suitable to its design, while allowing the unit to be shifted from place to place within the TTC zone in order to accommodate changing conditions.*

**Standard:**

**06 At pedestrian crossing locations, temporary lane separators shall have an opening or be shortened to provide a pathway that is at least 60 inches wide for crossing pedestrians.**

**Section 6F.73 Other Channelizing Devices**

**Option:**

*01 Channelizing devices other than those described in this Chapter may be used in special situations based on an engineering study.*

*Guidance:*

*02 Other channelizing devices should comply with the general size, color, stripe pattern, retroreflection, and placement characteristics established for the devices described in this Chapter.*

**Section 6F.74 Detectable Edging for Pedestrians**

**Support:**

*01 Individual channelizing devices, tape or rope used to connect individual devices, other discontinuous barriers and devices, and pavement markings are not detectable by persons with visual disabilities and are incapable of providing detectable path guidance on temporary or realigned sidewalks or other pedestrian facilities.*

*Guidance:*

*02 When it is determined that a facility should be accessible to and detectable by pedestrians with visual disabilities, a continuously detectable edging should be provided throughout the length of the facility such that it can be followed by pedestrians using long canes for guidance. This edging should protrude at least 6 inches above the surface of the sidewalk or pathway, with the bottom of the edging a maximum of ~~2.5~~2.0 inches above the surface. This edging should be continuous throughout the length of the facility except for gaps at locations where pedestrians or vehicles will be turning or crossing. This edging should consist of a prefabricated or formed-in-place curbing or other continuous device that is placed along the edge of the sidewalk or walkway. This edging should be firmly attached to the ground or to other devices. Adjacent sections of this edging should be interconnected such that the edging is not displaced by pedestrian or vehicular traffic or work operations, and such that it does not constitute a hazard to pedestrians, workers, or other road users.*

**Support:**

<sup>03</sup> Examples of detectable edging for pedestrians include:

- A. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected and fixed in place to form a continuous edge.
- B. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected, fixed in place, and placed at ground level to provide a continuous connection between channelizing devices located at intervals along the edge of the sidewalk or walkway.
- C. Sections of lumber interconnected and fixed in place to form a continuous edge.
- D. Formed-in-place asphalt or concrete curb.
- E. Prefabricated concrete curb sections that are interconnected and fixed in place to form a continuous edge.
- F. Continuous temporary traffic barrier or longitudinal channelizing barricades placed along the edge of the sidewalk or walkway that provides a pedestrian edging at ground level.
- G. Chain link or other fencing equipped with a continuous bottom rail.

**Guidance:**

<sup>04</sup> *Detectable pedestrian edging should be orange, white, or yellow and should match the color of the adjacent channelizing devices or traffic control devices, if any are present.*

<sup>05</sup> *If prefabricated edging is used to separate pedestrians and vehicular traffic, such edging should be certified as crashworthy (see section 6F.01). If section of lumber is used to form a railing system, any part of the railing that is more than 3 feet above pavement should be treated lumber and cause no harm to bare hand touching it.*

### **Section 6F.75 Temporary Raised Islands**

**Standard:**

<sup>01</sup> **Temporary raised islands shall be used only in combination with pavement striping and other suitable channelizing devices.**

**Option:**

<sup>02</sup> A temporary raised island may be used to separate vehicular traffic flows in two-lane, two-way operations on roadways having a vehicular traffic volume range of 4,000 to 15,000 average daily traffic (ADT) and on freeways having a vehicular traffic volume range of 22,000 ADT to 60,000 ADT.

<sup>03</sup> Temporary raised islands also may be used in other than two-lane, two-way operations where physical separation of vehicular traffic from the TTC zone is not required.

**Guidance:**

<sup>04</sup> *Temporary raised islands should have the basic dimensions of 4 inches high by at least 12 inches wide and have rounded or chamfered corners.*

<sup>05</sup> *The temporary raised islands should not be designed in such a manner that they would cause a motorist to lose control of the vehicle if the vehicle inadvertently strikes the temporary raised island. If struck, pieces of the island should not be dislodged to the extent that they could penetrate the occupant compartment or involve other vehicles.*

**Standard:**

<sup>06</sup> **At pedestrian crossing locations, temporary raised islands shall have an opening or be shortened to provide at least a 60-inch wide pathway for the crossing pedestrian.**

### **Section 6F.76 Opposing Traffic Lane Divider and Sign (W6-4)**

**Support:**

<sup>01</sup> Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.

**Standard:**

<sup>02</sup> **Opposing traffic lane dividers shall not be placed across pedestrian crossings.**

<sup>03</sup> **The Opposing Traffic Lane Divider (W6-4) sign (see Figure 6F-4) shall be an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 12 inches wide by 18 inches high.**

**Guidance:**

<sup>04</sup> *The Opposing Traffic Lane Divider (W6-4) sign should only be used to supplement a channelizing device that is being used to separate opposing traffic in a TTC zone.*

## Section 6F.77 Pavement Markings

### Support:

<sup>01</sup> Pavement markings are installed or existing markings are maintained or enhanced in TTC zones to provide road users with a clearly defined path for travel through the TTC zone in day, night, and twilight periods under both wet and dry pavement conditions.

### Guidance:

<sup>02</sup> *The work should be planned and staged to provide for the placement and removal of the pavement markings in a way that minimizes the disruption to traffic flow approaching and through the TTC zone during the placement and removal process.*

### Standard:

<sup>03</sup> **Existing pavement markings shall be maintained in all long-term stationary (see Section 6G.02) TTC zones in accordance with Chapters 3A and 3B, except as otherwise provided for temporary pavement markings in Section 6F.78. Pavement markings shall match the alignment of the markings in place at both ends of the TTC zone. Pavement markings shall be placed along the entire length of any paved detour or temporary roadway prior to the detour or roadway being opened to road users.**

<sup>04</sup> **For long-term stationary operations, pavement markings in the temporary traveled way that are no longer applicable shall be removed or obliterated as soon as practical. Pavement marking obliteration shall remove the non-applicable pavement marking material, and the obliteration method shall minimize pavement scarring. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration.**

### Option:

<sup>05</sup> Removable, non-reflective, preformed tape that is approximately the same color as the pavement surface may be used where markings need to be covered temporarily.

### Guidance:

<sup>06</sup> *Centerlines and lane lines should be placed, replaced, or delineated where appropriate before the roadway is opened to traffic.*

### Standard:

<sup>07</sup> **On State highways, whenever construction or maintenance work causes obliteration of center stripe, temporary or permanent center stripe shall be in place prior to opening the State highway to public traffic.**

## Section 6F.78 Temporary Markings

### Support:

<sup>01</sup> Temporary markings are those pavement markings or devices that are placed within TTC zones to provide road users with a clearly defined path of travel through the TTC zone when the permanent markings are either removed or obliterated during the work activities. Temporary markings are typically needed during the reconstruction of a road while it is open to traffic, such as overlays or surface treatments or where lanes are temporarily shifted on pavement that is to remain in place.

### Guidance:

<sup>02</sup> *Unless justified based on engineering judgment, temporary pavement markings should not remain in place for more than 14 days after the application of the pavement surface treatment or the construction of the final pavement surface on new roadways or over existing pavements.*

<sup>03</sup> *The temporary use of edge lines, channelizing lines, lane-reduction transitions, gore markings, and other longitudinal markings, and the various non-longitudinal markings (such as stop lines, railroad crossings, crosswalks, words, symbols, or arrows) should be in accordance with the State's or highway agency's policy.*

### Standard:

<sup>04</sup> **Warning signs, channelizing devices, and delineation shall be used to indicate required road user paths in TTC zones where it is not possible to provide a clear path by pavement markings.**

<sup>05</sup> **Except as otherwise provided in this Section, all temporary pavement markings for no-passing zones shall comply with the requirements of Chapters 3A and 3B. All temporary broken-line pavement markings shall use the same cycle length as permanent markings and shall have line segments that are at least 2 feet long.**

*Guidance:*

*06 All pavement markings and devices used to delineate road user paths should be reviewed during daytime and nighttime periods.*

*Option:*

*07 Half-cycle lengths with a minimum of 2-foot stripes may be used on roadways with severe curvature (see Section 3A.06) for broken line center lines in passing zones and for lane lines.*

*08 For temporary situations of 14 days or less, for a two- or three-lane road, no-passing zones may be identified by using DO NOT PASS (R4-1), PASS WITH CARE (R4-2), and NO PASSING ZONE (W14-3) signs (see Sections 2B.28, 2B.29, and 2C.45) rather than pavement markings. Also, DO NOT PASS, PASS WITH CARE, and NO PASSING ZONE signs may be used instead of pavement markings on roads with low volumes for longer periods in accordance with the State's or highway agency's policy.*

*Guidance:*

*09 If used, the DO NOT PASS, PASS WITH CARE, and NO PASSING ZONE signs should be placed in accordance with Sections 2B.28, 2B.29, and 2C.45.*

*10 If used, the NO CENTER LINE sign should be placed in accordance with Section 6F.47.*

**Standard:**

**11 Temporary lane lines and/or centerlines shall consist of retroreflectorized lines approximately 24 inch long, 4 inch wide, spaced approximately 24 feet apart.**

*Option:*

*12 Day/night raised retroreflectorized pavement markers, approved by the Department of Transportation, may be used in lieu of 24 inch lines. See Section 6F.79 for spacing requirements.*

*Guidance:*

*13 Right edge lines should not be simulated with dashed lines or raised pavement markers because they could confuse motorists.*

*Option:*

*14 Portable delineators, permanent type delineators, etc., may be used where it is considered desirable to enhance the edge of traveled way due to curvilinear alignment, narrowing pavement, etc.*

**Standard:**

**15 Locations on two-lane conventional highways where no-passing zone centerline delineation has been obliterated shall be posted with a sign package consisting of a ROAD (STREET) WORK (W20-1) sign or WORK ZONE (G20-5aP) plaque and a DO NOT PASS (R4-1) sign.**

*Guidance:*

*16 The R4-1 sign should be posted at 2000 foot intervals throughout the extended no-pass zone. A PASS WITH CARE (R4-2) sign should also be placed at the end of the zone.*

**Section 6F.79 Temporary Raised Pavement Markers**

*Option:*

*01 Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may be substituted for markings of other types in TTC zones.*

**Standard:**

**02 If used, the color and pattern of the raised pavement markers shall simulate the color and pattern of the markings for which they substitute.**

~~**03 If temporary raised pavement markers are used to substitute for broken line segments, a group of at least three retroreflective markers shall be equally spaced at no greater than N/8 (see Section 3B.14). The value of N for a broken or dotted line shall equal the length of one line segment plus one gap.**~~

~~**04 If temporary raised pavement markers are used to substitute for solid lines, the markers shall be equally spaced at no greater than N/4, with retroreflective or internally illuminated units at a spacing no greater than N/2. The value of N referenced for solid lines shall equal the N for the broken or dotted lines that might be adjacent to or might extend the solid lines (see Section 3B.11).**~~

**04a If raised pavement markers are used to substitute for broken line segments, at least two retroreflective markers shall be placed, one at each end of a segment of 3 feet. For segments over 8 feet, a group of at least three retroreflective markers shall be equally spaced at no greater than 4 feet. See Section 3A.06 for more details.**

Option:

05 Temporary raised pavement markers may be used to substitute for broken line segments by using at least two retroreflective markers placed at each end of a segment of 2 to 5 feet in length, using the same cycle length as permanent markings.

Guidance:

06 *Temporary raised pavement markers used on 2- to 5-foot segments to substitute for broken line segments should not be in place for more than 14 days unless justified by engineering judgment.*

07 *Raised pavement markers should be considered for use along surfaced detours or temporary roadways, and other changed or new travel-lane alignments.*

Option:

08 Retroreflective or internally illuminated raised pavement markers, or non-retroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may also be used in TTC zones to supplement markings as prescribed in Chapters 3A and 3B.

## **Section 6F.80 Delineators**

**Standard:**

01 **When used, delineators shall combine with or supplement other TTC devices. They shall be mounted on crashworthy supports so that the reflecting unit is approximately 4 feet above the near roadway edge. The standard color for delineators used along both sides of two-way streets and highways and the right-hand side of one-way roadways shall be white. Delineators used along the left-hand side of one-way roadways shall be yellow.**

Guidance:

02 *Spacing along roadway curves should be as set forth in Section 3F.04 and should be such that several delineators are constantly visible to the driver.*

Option:

03 Delineators may be used in TTC zones to indicate the alignment of the roadway and to outline the required vehicle path through the TTC zone.

**Standard:**

04 **The delineators shall be placed 2 feet to 6 feet outside the outer edge of the shoulder. Retroreflection of delineators shall be 3 x 12 inch minimum size.**

## **Section 6F.81 Lighting Devices**

Guidance:

01 *Lighting devices should be provided in TTC zones based on engineering judgment.*

02 *When used to supplement channelization, the maximum spacing for warning lights should be identical to the channelizing device spacing requirements.*

Option:

03 Lighting devices may be used to supplement retroreflectorized signs, barriers, and channelizing devices.

04 During normal daytime maintenance operations, the functions of flashing warning beacons may be provided by high-intensity rotating, flashing, oscillating, or strobe lights on a maintenance vehicle.

**Standard:**

05 **Although vehicle hazard warning lights are permitted to be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights, they shall not be used instead of high-intensity rotating, flashing, oscillating, or strobe lights.**

## Section 6F.82 Floodlights

### Support:

01 Utility, maintenance, or construction activities on highways are frequently conducted during nighttime periods when vehicular traffic volumes are lower. Large construction projects are sometimes operated on a double-shift basis requiring night work (see Section 6G.19).

### Guidance:

02 *When nighttime work is being performed, floodlights should be used to illuminate the work area, equipment crossings, and other areas.*

### Standard:

02a **Highway construction work lighting shall be as per Construction Safety Order 1523 (California Code of Regulations Title 8, Division 1, Chapter 4, Subchapter 4, Article 3, Section 1523 - Illumination). See Section 1A.11 for information regarding this publication.**

03 **Except in emergency situations, flagger stations shall be illuminated at night.**

04 **Floodlighting shall not produce a disabling glare condition for approaching road users, flaggers, or workers.**

### Guidance:

05 *The adequacy of the floodlight placement and elimination of potential glare should be determined by driving through and observing the floodlighted area from each direction on all approaching roadways after the initial floodlight setup, at night, and periodically.*

### Support:

06 Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of ~~5 foot candles~~ **10 foot candles (108 lux)** can be adequate for general activities. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 20 foot candles.

## Section 6F.83 Warning Lights

### Support:

01 Type A, Type B, Type C, and Type D 360-degree warning lights are portable, powered, yellow, lens-directed, enclosed lights.

### Standard:

02 **Warning lights shall be in accordance with the current ITE "Purchase Specification for Flashing and Steady-Burn Warning Lights" (see Section 1A.11).**

03 **When warning lights are used, they shall be mounted on signs or channelizing devices in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield.**

### Guidance:

04 *The maximum spacing for warning lights should be identical to the channelizing device spacing requirements.*

### Support:

05 The light weight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on signs and channelizing devices. The flashing lights are effective in attracting road users' attention.

### Option:

06 Warning lights may be used in either a steady-burn or flashing mode.

### Standard:

07 **Except for the sequential flashing warning lights that are described in Paragraphs 8 and 9, flashing warning lights shall not be used for delineation, as a series of flashers fails to identify the desired vehicle path.**

### Option:

08 A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.

### Standard:

09 **If a series of sequential flashing warning lights is used, the successive flashing of the lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to**

**identify the desired vehicle path. Each flashing warning light in the sequence shall be flashed at a rate of not less than 55 or more than 75 times per minute.**

**10 Type A Low-Intensity Flashing warning lights, Type C Steady-Burn warning lights, and Type D 360-degree Steady-Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.**

**11 Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.**

Support:

12 Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

Option:

13 Type A warning lights may be mounted on channelizing devices.

Support:

14 Type B High-Intensity Flashing warning lights are used to warn road users during both daylight and nighttime hours that they are approaching a potentially hazardous area.

Option:

15 Type B warning lights are designed to operate 24 hours per day and may be mounted on advance warning signs or on independent supports.

16 Type C Steady-Burn warning lights and Type D 360-degree Steady-Burn warning lights may be used during nighttime hours to delineate the edge of the traveled way.

Guidance:

17 *When used to delineate a curve, Type C and Type D 360-degree warning lights should only be used on devices on the outside of the curve, and not on the inside of the curve.*

Support:

18 Flashing warning beacon is a type of warning light and often used to supplement other TTC devices.

**Standard:**

**19 Flashing warning beacon shall comply with the provisions of Chapter 4L and Department of Transportation's standard signal lenses. A flashing warning beacon shall be a flashing yellow light with a minimum nominal diameter of 12 inch. Where flashing warning beacon is required, a Type B warning light shall not be used in its place. When placed within 15 feet of the edge of travel way the beacon and its support shall be certified as crashworthy (see section 6F.01) or the beacon shall meet the lightweight criteria set for Type B warning light and is mounted on a certified crashworthy support. The mounting height shall be between 6 feet and 10 feet, measured from the bottom of the base to the center of the lens.**

## **Section 6F.84 Temporary Traffic Control Signals**

**Standard:**

**01 Temporary traffic control signals (see Section 4D.32) used to control road user movements through TTC zones and in other TTC situations shall comply with the applicable provisions of Part 4 and for State highways, the Department of Transportation's Standard Plans and/or Special Provisions. See Section 1A.11 for information regarding this publication.**

Support:

02 Temporary traffic control signals are typically used in TTC zones such as temporary haul road crossings; temporary one-way operations along a one-lane, two-way highway; temporary one-way operations on bridges, reversible lanes, and intersections.

**Standard:**

**03 A temporary traffic control signal that is used to control traffic through a one-lane, two-way section of roadway shall comply with the provisions of Section 4H.02.**

Guidance:

04 *Where pedestrian traffic is detoured to a temporary traffic control signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals (see Section 4E.09) are needed for crossing along an alternate route.*

*05 When temporary traffic control signals are used, conflict monitors typical of traditional traffic control signal operations should be used.*

**Option:**

*06 Temporary traffic control signals may be portable or temporarily mounted on fixed supports.*

**Guidance:**

*07 Temporary traffic control signals should only be used in situations where temporary traffic control signals are preferable to other means of traffic control, such as changing the work staging or work zone size to eliminate one-way vehicular traffic movements, using flaggers to control one-way or crossing movements, using STOP or YIELD signs, and using warning devices alone.*

**Support:**

*08 Factors related to the design and application of temporary traffic control signals include the following:*

- A. Safety and road user needs;
- B. Work staging and operations;
- C. The feasibility of using other TTC strategies (for example, flaggers, providing space for two lanes, or detouring road users, including bicyclists and pedestrians);
- D. Sight distance restrictions;
- E. Human factors considerations (for example, lack of driver familiarity with temporary traffic control signals);
- F. Road-user volumes including roadway and intersection capacity;
- G. Affected side streets and driveways;
- H. Vehicle speeds;
- I. The placement of other TTC devices;
- J. Parking;
- K. Turning restrictions;
- L. Pedestrians;
- M. The nature of adjacent land uses (such as residential or commercial);
- N. Legal authority;
- O. Signal phasing and timing requirements;
- P. Full-time or part-time operation;
- Q. Actuated, fixed-time, or manual operation;
- R. Power failures or other emergencies;
- S. Inspection and maintenance needs;
- T. Need for detailed placement, timing, and operation records; and
- U. Operation by contractors or by others.

*09 Although temporary traffic control signals can be mounted on trailers or lightweight portable supports, fixed supports offer superior resistance to displacement or damage by severe weather, vehicle impact, and vandalism.*

**Guidance:**

*10 Other TTC devices should be used to supplement temporary traffic control signals, including warning and regulatory signs, pavement markings, and channelizing devices.*

*11 Temporary traffic control signals not in use should be covered or removed.*

*12 If a temporary traffic control signal is located within 1/2 mile of an adjacent traffic control signal, consideration should be given to interconnected operation.*

**Standard:**

**13 Temporary traffic control signals shall not be located within 200 feet of a grade crossing unless the temporary traffic control signal is provided with preemption in accordance with Section 4D.27, or unless a uniformed officer or flagger is provided at the crossing to prevent vehicles from stopping within the crossing.**

## **Section 6F.85 Temporary Traffic Barriers**

**Support:**

*01 Temporary traffic barriers, including shifting portable or movable barriers, are devices designed to help prevent penetration by vehicles while minimizing injuries to vehicle occupants, and to protect workers, bicyclists, and pedestrians.*

02 The four primary functions of temporary traffic barriers are:

- A. To keep vehicular traffic from entering work areas, such as excavations or material storage sites;
- B. To separate workers, bicyclists, and pedestrians from motor vehicle traffic;
- C. To separate opposing directions of vehicular traffic; and
- D. To separate vehicular traffic, bicyclists, and pedestrians from the work area such as false work for bridges and other exposed objects.

Option:

03 Temporary traffic barriers may be used to separate two-way vehicular traffic.

Guidance:

04 *Because the protective requirements of a TTC situation have priority in determining the need for temporary traffic barriers, their use should be based on an engineering study.*

**Standard:**

05 **Temporary traffic barriers shall be supplemented with standard delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility if they are used to channelize vehicular traffic. The delineation color shall match the applicable pavement marking color.**

06 **Temporary traffic barriers, including their end treatments, shall be crashworthy. In order to mitigate the effect of striking the upstream end of a temporary traffic barrier, the end shall be installed in accordance with AASHTO's "Roadside Design Guide" (see Section 1A.11) by flaring until the end is outside the acceptable clear zone or by providing crashworthy end treatments.**

Option:

07 Warning lights or steady-burn lamps may be mounted on temporary traffic barrier installations.

07a Side reflectors with cube-corner lenses or top mounted reflectors (facing the driver) may be used on temporary traffic barriers.

Guidance:

07b *If used, the spacing of these reflectors should not exceed a distance in feet equal to 1.0 times the speed limit in mph through the TTC zone.*

Support:

08 Movable barriers are capable of being repositioned laterally using a transfer vehicle that travels along the barrier. Movable barriers enable short-term closures to be installed and removed on long-term projects. Providing a barrier-protected work space for short-term closures and providing unbalanced flow to accommodate changes in the direction of peak-period traffic flows are two of the advantages of using movable barriers.

09 Figure 6H-45 shows a temporary reversible lane using movable barriers. The notable feature of the movable barrier is that in both Phase A and Phase B, the lanes used by opposing traffic are separated by a barrier.

10 Figure 6H-34 shows an exterior lane closure using a temporary traffic barrier. Notes 7 through 9 address the option of using a movable barrier. By using a movable barrier, the barrier can be positioned to close the lane during the off-peak periods and can be relocated to open the lane during peak periods to accommodate peak traffic flows. With one pass of the transfer vehicle, the barrier can be moved out of the lane and onto the shoulder. Furthermore, if so desired, with a second pass of the transfer vehicle, the barrier could be moved to the roadside beyond the shoulder.

11 More specific information on the use of temporary traffic barriers is contained in Chapters 8 and 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11).

Support:

12 *More specific information on the use of portable barriers and crash cushions can be obtained from the Department of Transportation's Standard Plans and Standard Specifications. See Section 1A.11 for information regarding this publication.*

## **Section 6F.86 Crash Cushions**

Support:

01 Crash cushions are systems that mitigate the effects of errant vehicles that strike obstacles, either by smoothly decelerating the vehicle to a stop when hit head-on, or by redirecting the errant vehicle. The two types of crash cushions that are used in TTC zones are stationary crash cushions and truck-mounted attenuators. Crash cushions in TTC zones help protect the drivers from the exposed ends of barriers, fixed objects, shadow vehicles, and other

obstacles. Specific information on the use of crash cushions can be found in AASHTO's "Roadside Design Guide" (see Section 1A.11).

**Standard:**

**02 Crash cushions shall be crashworthy. They shall also be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced to maintain their crashworthiness.**

Support:

03 Stationary crash cushions are used in the same manner as permanent highway installations to protect drivers from the exposed ends of barriers, fixed objects, and other obstacles.

**Standard:**

**04 Stationary crash cushions shall be designed for the specific application intended.**

**05 Truck-mounted attenuators shall be energy-absorbing devices attached to the rear of shadow trailers or trucks. If used, the shadow vehicle with the attenuator shall be located in advance of the work area, workers, or equipment to reduce the severity of rear-end crashes from errant vehicles.**

Support:

06 Trucks or trailers are often used as shadow vehicles to protect workers or work equipment from errant vehicles. These shadow vehicles are normally equipped with flashing arrows, changeable message signs, and/or high-intensity rotating, flashing, oscillating, or strobe lights located properly in advance of the workers and/or equipment that they are protecting. However, these shadow vehicles might themselves cause injuries to occupants of the errant vehicles if they are not equipped with truck-mounted attenuators.

*Guidance:*

*07 The shadow truck should be positioned a sufficient distance in advance of the workers or equipment being protected so that there will be sufficient distance, but not so much so that errant vehicles will travel around the shadow truck and strike the protected workers and/or equipment.*

Support:

08 Chapter 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11) contains additional information regarding the use of shadow vehicles.

*Guidance:*

*09 If used, the truck-mounted attenuator should be used in accordance with the manufacturer's specifications.*

Support:

10 Information about designs and types of crash cushions currently approved for use on State highways is available from Department of Transportation's Division of Traffic Operations in Sacramento.

## **Section 6F.87 Rumble Strips**

Support:

01 Transverse rumble strips consist of intermittent, narrow, transverse areas of rough-textured or slightly raised or depressed road surface that extend across the travel lanes to alert drivers to unusual vehicular traffic conditions. Through noise and vibration they attract the driver's attention to such features as unexpected changes in alignment and to conditions requiring a stop.

02 Longitudinal rumble strips consist of a series of rough-textured or slightly raised or depressed road surfaces located along the shoulder to alert road users that they are leaving the travel lanes.

**Standard:**

**03 If it is desirable to use a color other than the color of the pavement for a longitudinal rumble strip, the color of the rumble strip shall be the same color as the longitudinal line the rumble strip supplements.**

**04 If the color of a transverse rumble strip used within a travel lane is not the color of the pavement, the color of the rumble strip shall be white, black, or orange.**

Option:

05 Intervals between transverse rumble strips may be reduced as the distance to the approached conditions is diminished in order to convey an impression that a closure speed is too fast and/or that an action is imminent. A sign warning drivers of the onset of rumble strips may be placed in advance of any transverse rumble strip installation.

*Guidance:*

*06 Transverse rumble strips should be placed transverse to vehicular traffic movement. They should not adversely affect overall pavement skid resistance under wet or dry conditions.*

*07 In urban areas, even though a closer spacing might be warranted, transverse rumble strips should be designed in a manner that does not promote unnecessary braking or erratic steering maneuvers by road users.*

*08 Transverse rumble strips should not be placed on sharp horizontal or vertical curves.*

*09 Rumble strips should not be placed through pedestrian crossings ~~or on bicycle routes~~.*

*10 ~~Transverse rumble strips should not be placed on roadways used by bicyclists unless a minimum clear path of 4 feet is provided at each edge of the roadway or on each paved shoulder as described in AASHTO's "Guide to the Development of Bicycle Facilities" (see Section 1A.11).~~*

*11 ~~Longitudinal rumble strips should not be placed on the shoulder of a roadway that is used by bicyclists unless a minimum clear path of 4 feet is also provided on the shoulder.~~*

## **Section 6F.88 Screens**

**Support:**

*01 Screens are used to block the road users' view of activities that can be distracting. Screens might improve safety and motor vehicle traffic flow where volumes approach the roadway capacity because they discourage gawking and reduce headlight glare from oncoming motor vehicle traffic.*

*Guidance:*

*02 Screens should not be mounted where they could adversely restrict road user visibility and sight distance and adversely affect the reasonably safe operation of vehicles.*

**Option:**

*03 Screens may be mounted on the top of temporary traffic barriers that separate two-way motor vehicle traffic.*

*03a Temporary traffic screen may be mounted on top of temporary traffic barriers, when barriers are used in transition and crossover areas for glare-control on high-volume roadways.*

*Guidance:*

*03b If used, temporary traffic screen panels should be contiguous without gaps, minimum 32 inch in height, and orange or red-orange in color.*

*04 Design of screens should be in accordance with Chapter 9 of AASHTO's "Roadside Design Guide" (see Section 1A.11).*

## **Section 6F.101(CA) LOOSE GRAVEL Sign (W8-7)**

*Guidance:*

*01 The LOOSE GRAVEL (W8-7) sign should be used on chip seal jobs or other areas to warn motorists that there is loose gravel on the roadway.*

**Standard:**

**02 When used, the W8-7 sign shall be placed at the beginning of work and at maximum 2000 feet intervals.**

**Option:**

*03 When warning is intended to be directed primarily to motorcyclists, use of the W8-7 sign with motorcycle plaque (W8-15P) may be considered.*

*04 The Advisory Speed (W13-1) plaque may be used in combination with the W8-7 sign to indicate the need to decrease speed at a particular location.*

*Guidance:*

*05 The advisory speed should be reasonable or prudent, considering weather, visibility, traffic, surface condition and width of the roadway.*

**Standard:**

**06 On State highways for seal coat projects, the W13-1 (35) plaque shall supplement the W8-7 sign during placing and/or brooming of screenings.**

### **Section 6F.102(CA) NARROW LANE(S) Sign (C12(CA))**

**Option:**

**01** The NARROW LANE(S) (C12(CA)) sign may be used, when appropriate, to warn the approaching motorist of a narrow lane condition.

**Guidance:**

**02** *When used, the C12(CA) sign should be used in conjunction with an Advisory Speed (W13-1) plaque. See Section 2C.08.*

### **Section 6F.103(CA) OPEN TRENCH Sign (C27(CA))**

**Standard:**

**01** The OPEN TRENCH (C27(CA)) sign shall be used in advance of open trenches in/or adjacent to roadway.

**02** The edge of the traveled way shall be defined by edge line delineation consisting of appropriate markers or striping. Edge line delineation shall be white when located on the right of traffic and yellow when located on the left of traffic.

**Guidance:**

**03** *Trenches in excess of 0.15 feet in depth but not exceeding 0.25 feet in depth that are less than 8 feet from the edge of traveled way should be identified by LOW SHOULDER (W8-9) signs on Type II barricades set in the trench adjacent to the edge of pavement at intervals not to exceed every 2,000 feet.*

**Option:**

**04** Portable delineators may be placed at intervals not to exceed 100 feet in lieu of edge line delineation.

**Standard:**

**05** Trenches in excess of 0.25 feet in depth that are less than 8 feet from the edge of traveled way shall be identified by C27(CA) and NO SHOULDER (C31A(CA)) signs on Type II or Type III barricades alternately set in the trench at intervals not to exceed every 2,000 feet.

**Guidance:**

**06** *Channelizers (CA) or delineators should be placed 2 feet to 6 feet outside of the edge line at 100 foot intervals.*

**07** *Trenches in excess of 0.25 feet in depth but not exceeding 2.5 feet in depth that are 8 feet to 15 feet from the edge of traveled way should be identified by C27(CA) signs on Type II or Type III barricades set in the trench at intervals not to exceed every 2,000 feet. Delineators should be placed at 200 foot intervals within 2 feet from the edge of the trench and at 100 foot intervals for edge conditions exceeding 0.5 feet in depth.*

**08** *Trenches in excess of 0.5 feet in depth but not exceeding 2.5 feet in depth that are more than 15 feet from the edge of traveled way at locations where a recovery area was available prior to construction should be identified by placing delineators at 200 foot intervals within 2 feet from the edge of the trench and by placing C27(CA) signs in the trench at intervals not to exceed every 2,000 feet.*

**Standard:**

**09** **Signing for trenches in excess of 2.5 feet in depth shall be based upon engineering judgment or studies (as noted in Section 1A.09) to ensure proper visibility of barricades and signing.**

### **Section 6F.104(CA) Moving Lane Closure Signs (W23-1 and SC10(CA), SC11(CA), SC13(CA), SC15(CA))**

**Standard:**

**01** On State highways, the following signs shall be used as shown in the Department of Transportation's Standard Plans T15, T16 and T17 for moving lane closures. See Section 1A.11 for information regarding this publication.

**A. LANE CLOSED AHEAD or ROAD WORK AHEAD (SC10(CA)).**

**B. LANE CLOSED (SC11(CA)).**

**C. SLOW TRAFFIC AHEAD (W23-1).**

**D. DO NOT PASS (SC13(CA)).**

**E. CAUTION (SC15(CA)).**

**02** The Moving Lane Closure signs shall have a black legend on either a white or an orange background.

- 03 If used, the SC10(CA) sign and a Type II flashing arrow sign shall be mounted on the rear of the designated sign vehicle.
- 04 The SC11(CA) sign and a Type II flashing arrow sign shall be mounted on the rear of the designated sign vehicle.
- 05 If used, the W23-1 sign shall be mounted on the rear of the designated sign vehicle.
- 06 The SC13(CA) sign shall be mounted on the rear and/or the front of the designated sign vehicle.
- 07 If used, the SC15(CA) sign shall be mounted on the front of the designated sign vehicle.

### Section 6F.105(CA) Object Markers

#### Standard:

- 01 When used in work zones, the Type N-3(CA) or OM1-3 object markers shall have an orange retroreflective background.
- 02 When used in work zones, the Type P(CA), R(CA), OM-3L, OM-3R and OM-3C object marker shall have alternating retroreflective orange and white stripes.

#### Support:

- 03 Figure 6F-103(CA) shows examples of object markers in TTC zones.
- 04 See Chapter 2C for more details.

### Section 6F.106(CA) Slow For The Cone Zone (SC19(CA) and SC20(CA)) Signs

#### Option:

- 01 The Slow For The Cone Zone (SC19(CA)) and SLOW FOR THE CONE ZONE (SC20(CA)) signs (see Figures 6H-32(CA), 6H-33 & 6H-36(CA)) may be used to remind motorists to slow down when entering a temporary traffic control (TTC) zone to improve worker and road user safety.

#### Guidance:

- 02 If used, the Slow For The Cone Zone (SC19(CA)) Sign should be located after the ROAD (STREET) WORK, XX FT, XX MILES, or AHEAD (W20-1) sign.
- 03 If used, the SLOW FOR THE CONE ZONE (SC20(CA)) Sign should be located in the portion of the TTC zone where channelizing devices are being used.

#### Option:

- 04 A pictograph may be used on the SC19(CA) sign to identify a governmental jurisdiction, an area of jurisdiction, a governmental agency, a military base or branch of service, a governmental-approved university or college, or a governmental-approved institution.

#### Standard:

- 05 If a pictograph is used on the SC19(CA) sign, the maximum dimension (height or width) of a pictograph shall not exceed two times the letter height of the largest legend used on the sign.

### Section 6F.107(CA) FRESH CONCRETE (C43(CA)) Sign

#### Option:

- 01 The FRESH CONCRETE (C43(CA)) sign (see Figure 6F-101(CA)) may be used to warn road users of the surface treatment

#### Standard:

- 02 When used, the FRESH CONCRETE (C43(CA)) sign shall be placed at the beginning of the pavement work area.

#### Guidance:

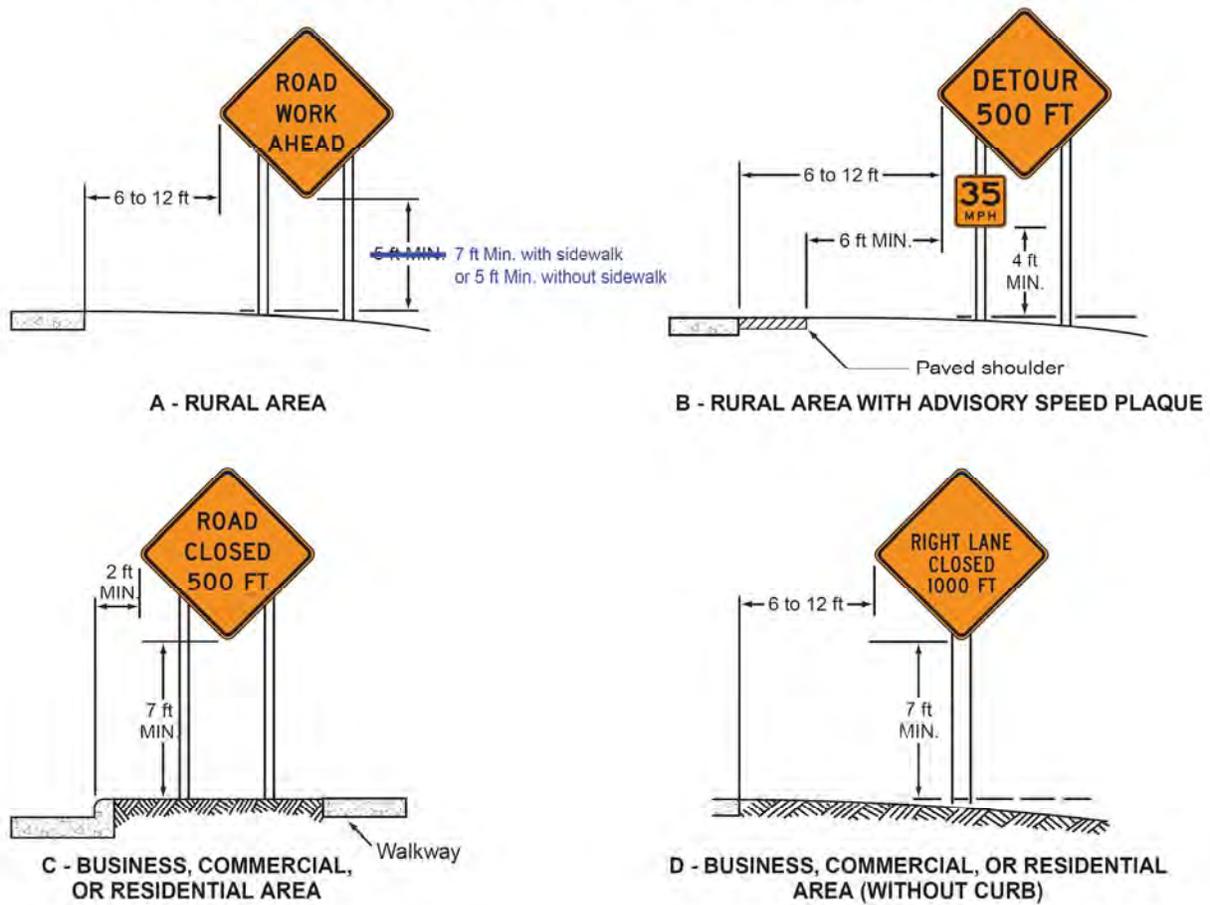
- 03 The FRESH CONCRETE (C43(CA)) sign should remain in place during the entire curing period.

### Section 6F.108(CA) CAUTION FREQUENT STOPPING AND BACKING STAY BACK 100 FEET (SC21(CA)) Sign

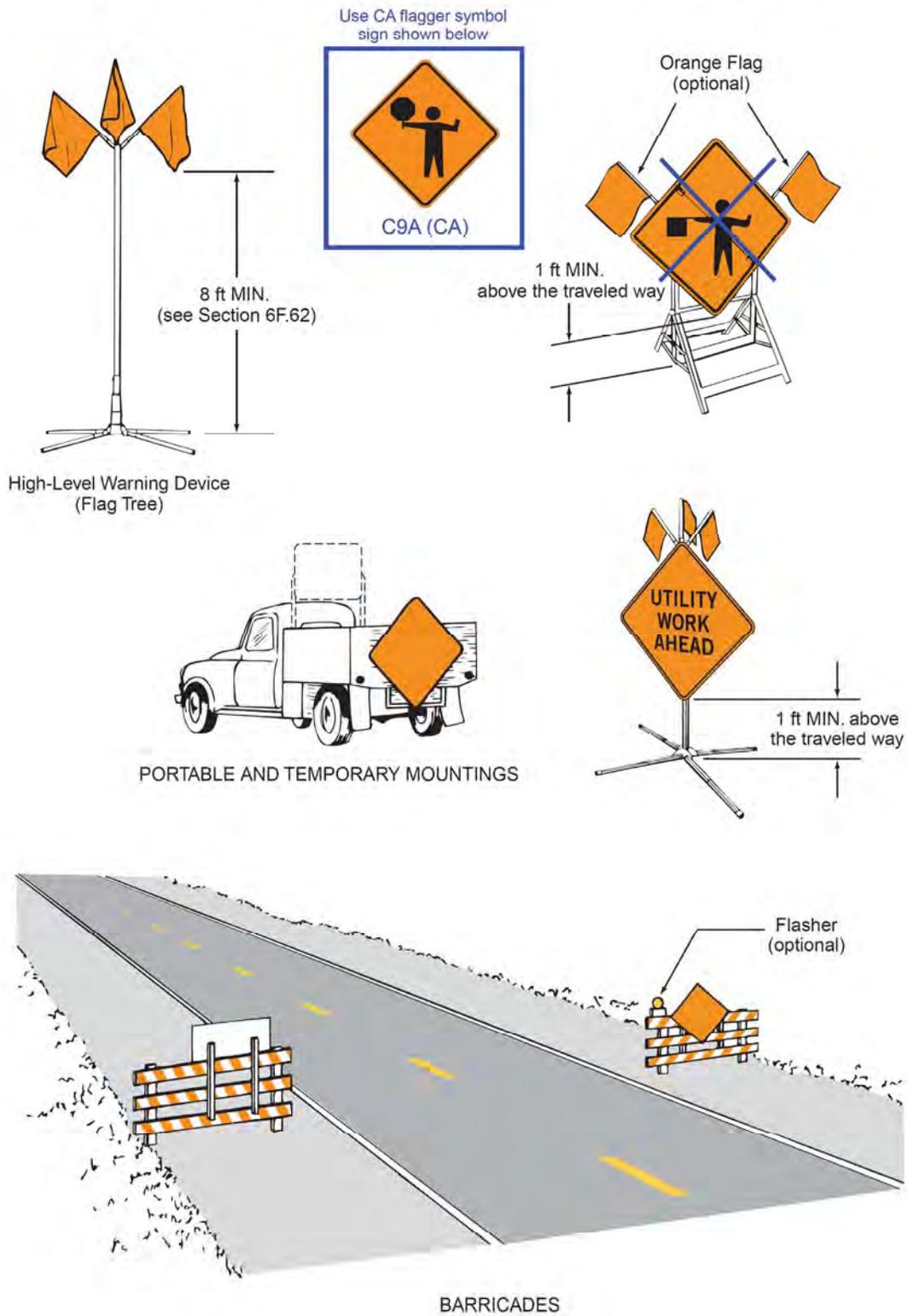
#### Option:

- 01 For mobile operations, CAUTION FREQUENT STOPPING AND BACKING STAY BACK 100 FEET (SC21(CA)) Sign may be mounted on a work vehicle to warn road users and workers of the frequent stopping and backing maneuvers made by the vehicle.

**Figure 6F-1. Height and Lateral Location of Signs—Typical Installations**



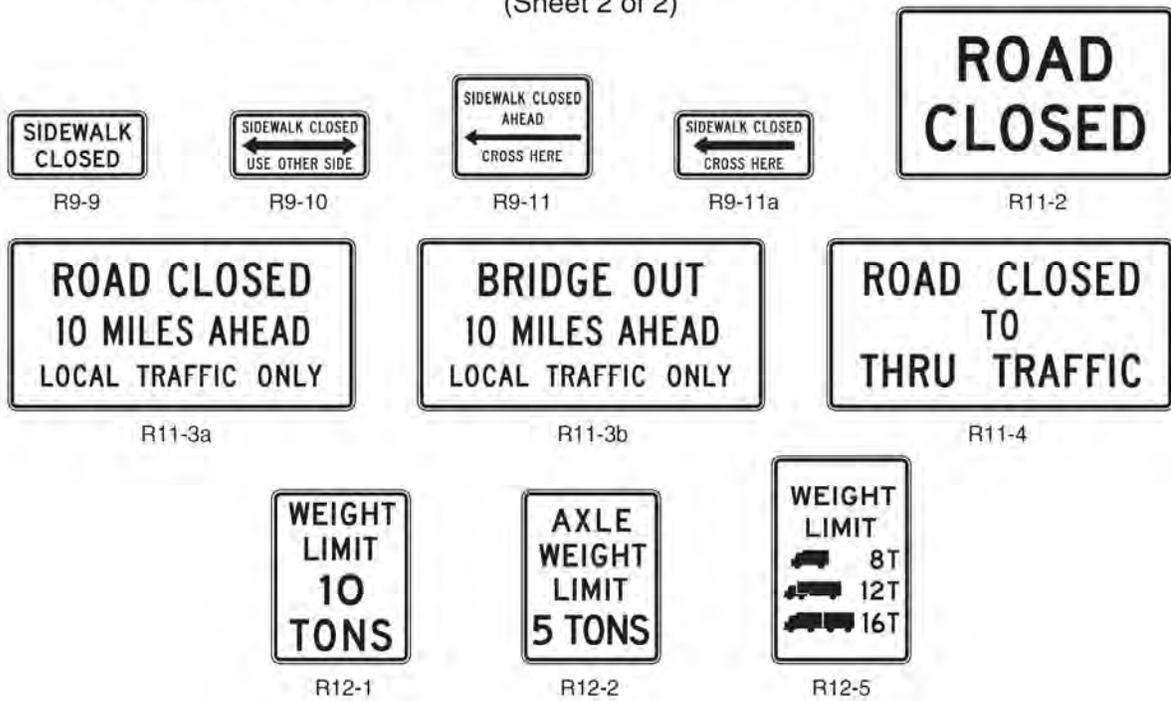
**Figure 6F-2. Methods of Mounting Signs Other Than on Posts**



**Figure 6F-3. Regulatory Signs and Plaques in Temporary Traffic Control Zones**  
 (Sheet 1 of 2)



**Figure 6F-3. Regulatory Signs and Plaques in Temporary Traffic Control Zones**  
(Sheet 2 of 2)



**Figure 6F-4. Warning Signs and Plaques in Temporary Traffic Control Zones**  
 (Sheet 1 of 3)



**Figure 6F-4. Warning Signs and Plaques in Temporary Traffic Control Zones**  
 (Sheet 2 of 3)

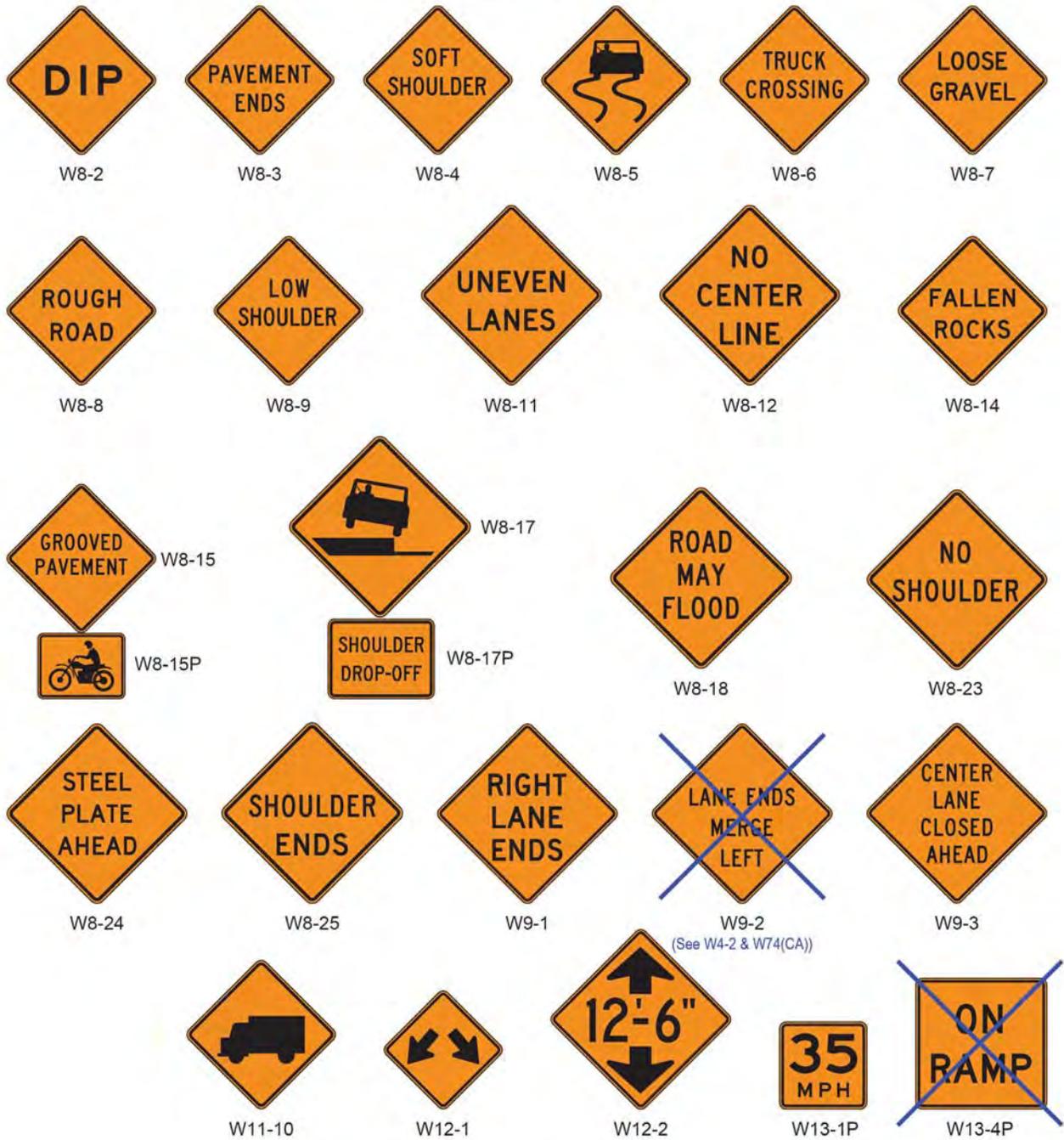
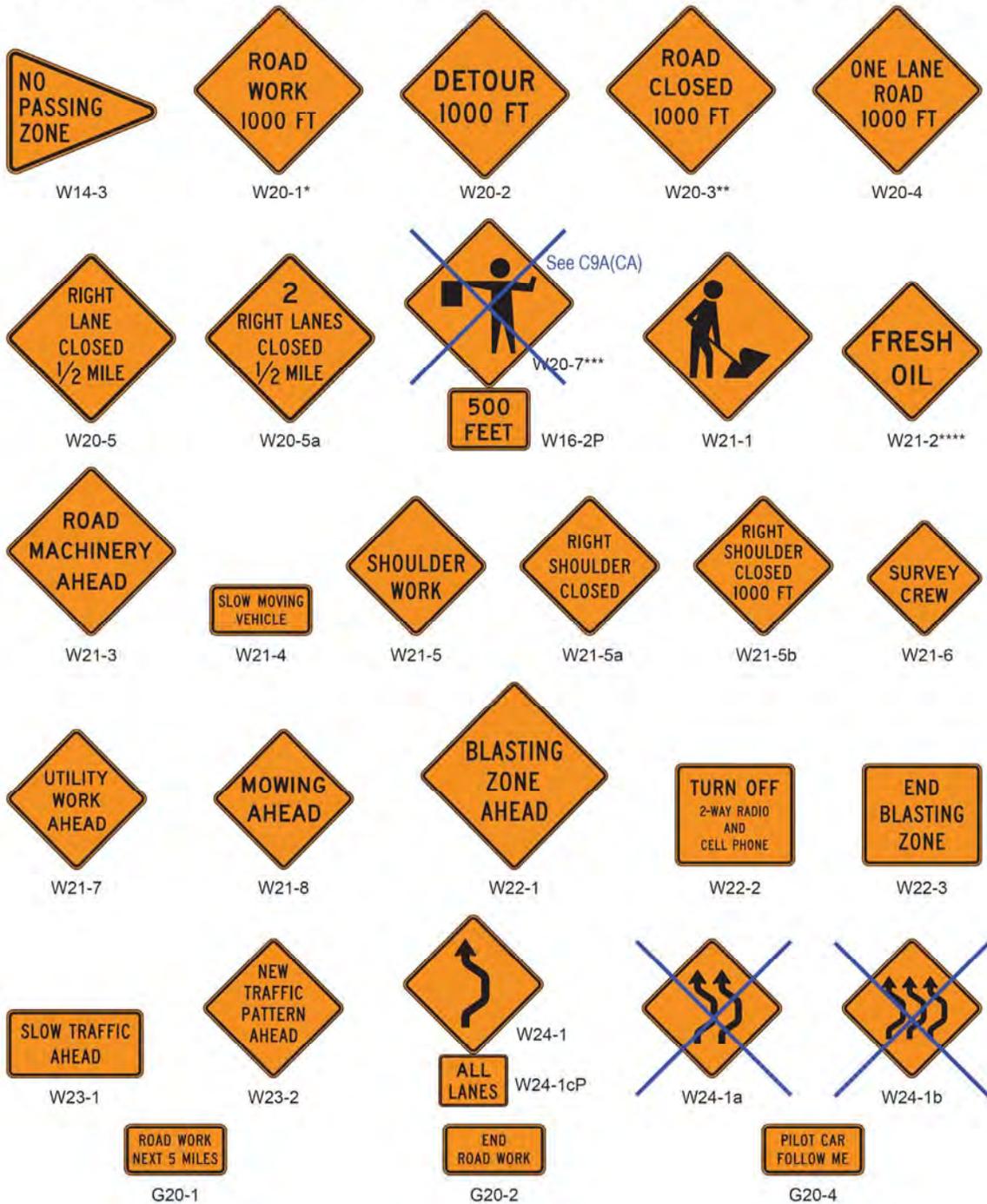


Figure 6F-4. Warning Signs and Plaques in Temporary Traffic Control Zones (Sheet 3 of 3)

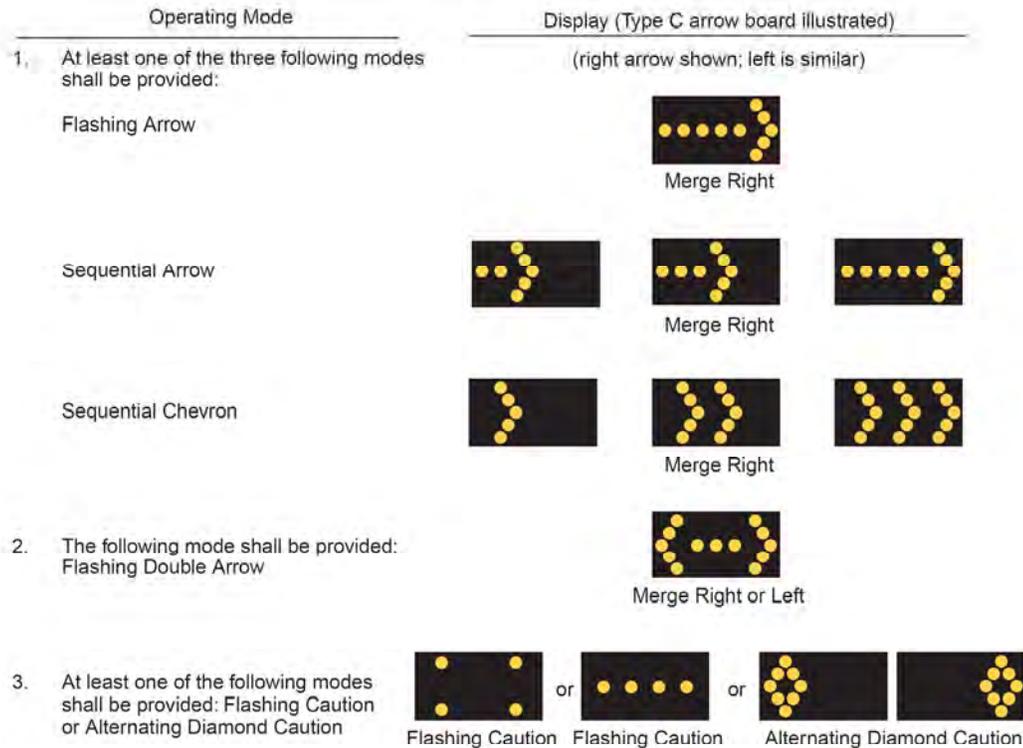


\* An optional STREET WORK word message sign is shown in the "Standard Highway Signs and Markings" book.  
 \*\* An optional STREET CLOSED word message sign is shown in the "Standard Highway Signs and Markings" book.  
 \*\*\* An optional FLAGGER (W20-7a) word message sign is shown in the "Standard Highway Signs and Markings" book.  
 \*\*\*\* An optional FRESH TAR word message sign is shown in the "Standard Highway Signs and Markings" book.

Figure 6F-5. Exit Open and Closed and Detour Signs



**Figure 6F-6. Advance Warning Arrow Board Display Specifications**



Arrow Board Type	Minimum Size	Minimum Legibility Distance	Minimum Number of Elements	Appropriate Use***
A	48 x 24 inches	1/2 mile	12	Low-speed urban streets
B	60 x 30 inches	3/4 mile	13	Intermediate-speed facilities and maintenance or mobile operations on high-speed roadways
II**	72 x 36 inches*	3/4 mile	13	Use in place of Type B or C
C or I	96 x 48 inches	1 mile	15	High-speed, high volume roadways
D	None*	1/2 mile	12	On authorized vehicles

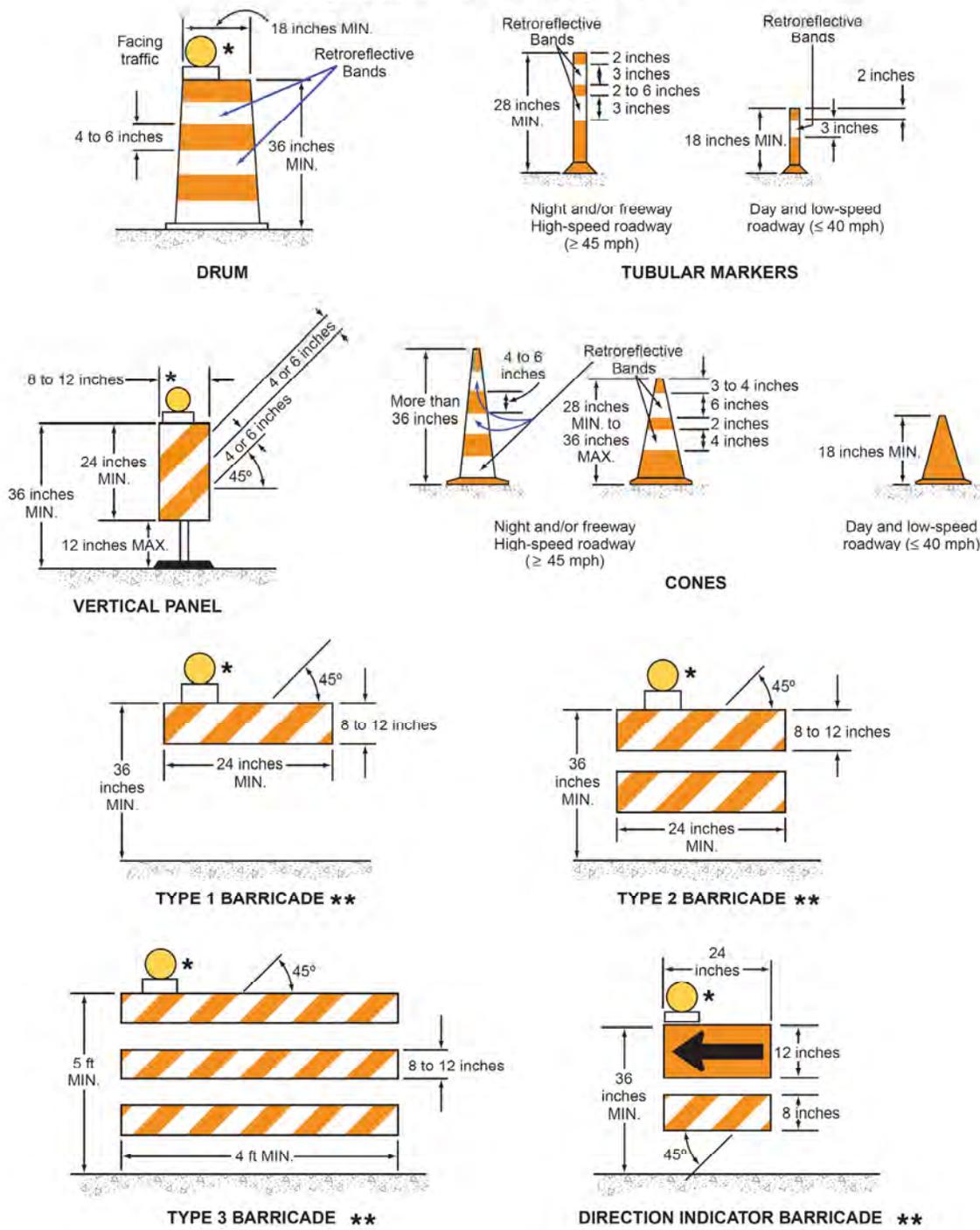
\*Length of arrow equals 48 inches, width of arrowhead equals 24 inches

**Standard:**

\*\* For State highways, the panel Type B shall be replaced by Type II.

\*\*\* See Section 6F.61 for more details.

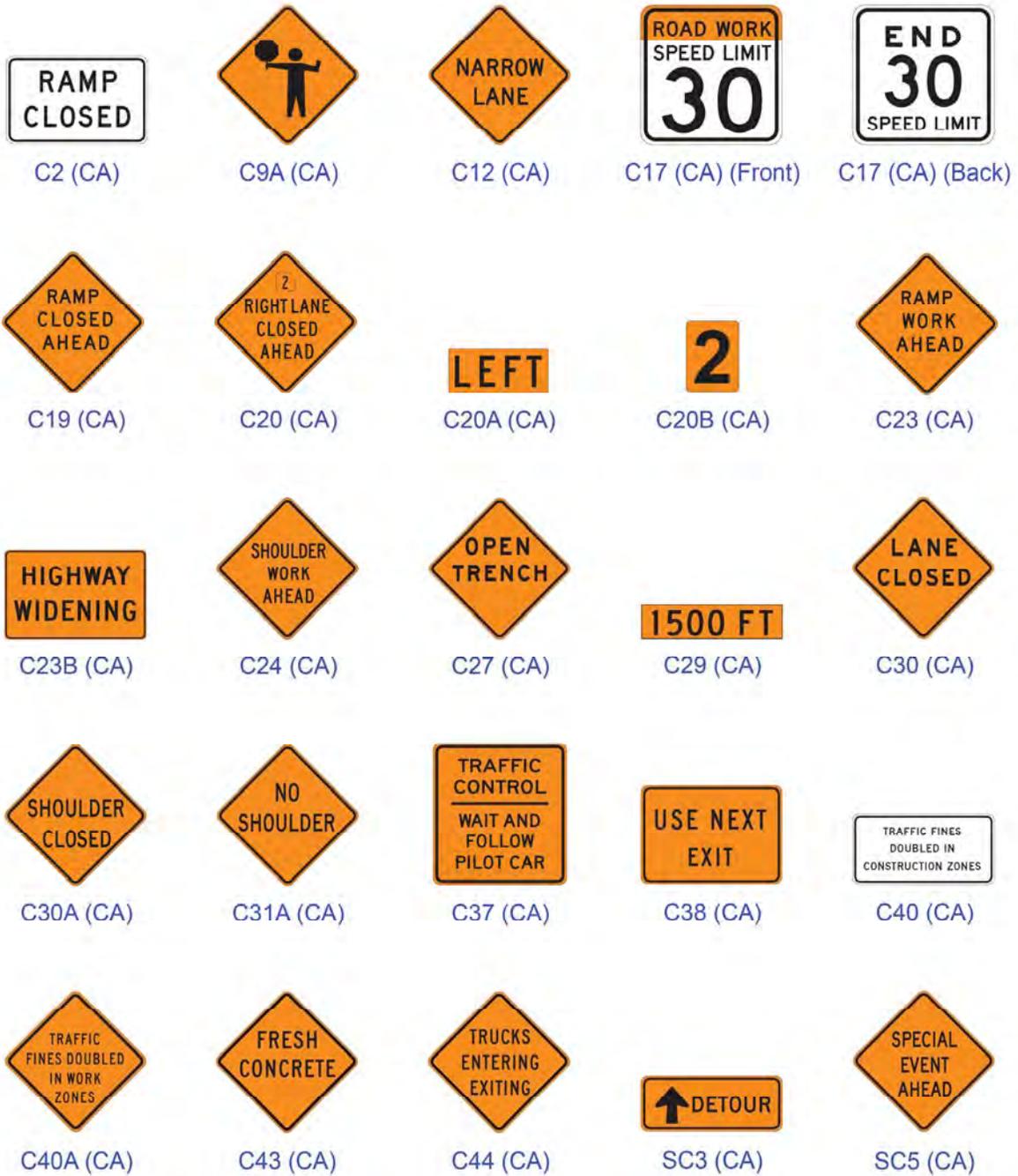
**Figure 6F-7. Channelizing Devices**



\* Warning lights (optional)

\*\* Rail stripe widths shall be 6 inches, except that 4-inch wide stripes may be used if rail lengths are less than 36 inches. The sides of barricades facing traffic shall have retroreflective rail faces.

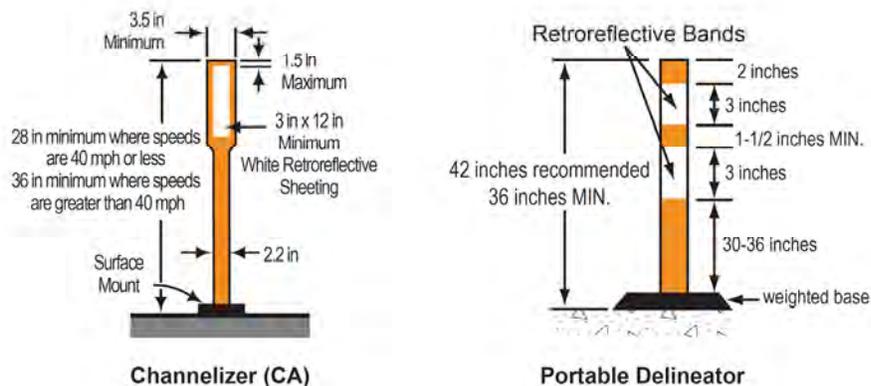
**Figure 6F-101 (CA). California Temporary Traffic Control Signs  
 (Sheet 1 of 2)**



**Figure 6F-101 (CA). California Temporary Traffic Control Signs  
 (Sheet 2 of 2)**

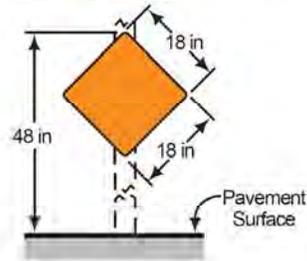


**Figure 6F-102 (CA). Channelizer (CA) and Portable Delineator**

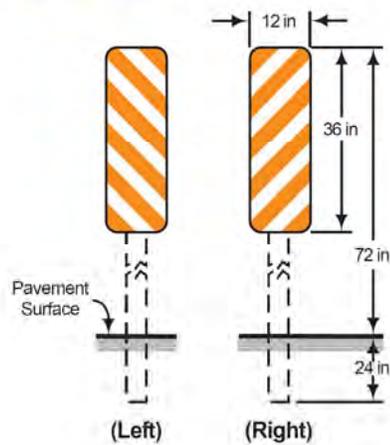


**Figure 6F-103 (CA). Examples of Object Markers in Temporary Traffic Control Zones**

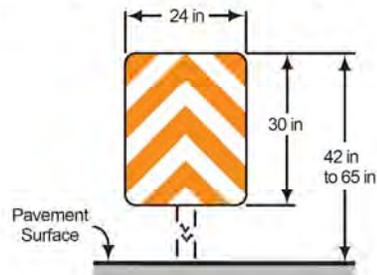
**Type N-3 (CA) Object Marker (OM1-3)**



**Type P (CA) Object Markers (OM-3L&R)**



**Type R (CA) Object Marker (OM-3C)**



**Table 6F-1. Temporary Traffic Control Zone Sign and Plaque Sizes (Sheet 1 of 3)**

Sign or Plaque	Sign Designation	Section	Conventional Road	Freeway or Expressway	Minimum
Stop	R1-1	6F.06	30 x 30*	—	—
Stop (on Stop/Slow Paddle)	R1-1	6E.03	18 x 18	—	—
Yield	R1-2	6F.06	36 x 36 x 36*	—	30 x 30 x 30
To Oncoming Traffic (plaque)	R1-2aP	6F.06	36 x 30	48 x 36	24 x 18
Wait on Stop	R1-7	6E.05	24 x 30	24 x 30	—
Go on Slow	R1-8	6E.05	24 x 30	24 x 30	—
Speed Limit	R2-1	6F.12	24 x 30*	36 x 48	—
Fines Higher (plaque)	R2-6P	6F.12	24 x 18	36 x 24	—
Fines Double (plaque)	R2-6aP	6F.12	24 x 18	36 x 24	—
\$XX Fine (plaque)	R2-6bP	6F.12	24 x 18	36 x 24	—
Begin Higher Fines Zone	R2-10	6F.12	24 x 30	36 x 48	—
End Higher Fines Zone	R2-11	6F.12	24 x 30	36 x 48	—
End Work Zone Speed Limit	R2-12	6F.12	24 x 36	36 x 54	—
Movement Prohibition	R3-1,2,3,4,18,27	6F.06	24 x 24*	36 x 36	—
Mandatory Movement (1 lane)	R3-5	6F.06	30 x 36	—	—
Optional Movement (1 lane)	R3-6	6F.06	30 x 36	—	—
Mandatory Movement (text)	R3-7	6F.06	30 x 30*	—	—
Advance Intersection Lane Control	R3-8	6F.06	Varies x 30	—	—
Do Not Pass	R4-1	6F.06	24 x 30	36 x 48	—
Pass With Care	R4-2	6F.06	24 x 30	36 x 48	—
Keep Right	R4-7	6F.06	24 x 30	36 x 48	—
Narrow Keep Right	R4-7c	6F.06	18 x 30	—	—
Stay in Lane	R4-9	6F.11	24 x 30	36 x 48	—
Do Not Enter	R5-1	6F.06	30 x 30*	36 x 36	—
Wrong Way	R5-1a	6F.06	36 x 24*	42 x 30	—
One Way	R6-1	6F.06	36 x 12*	54 x 18	—
One Way	R6-2	6F.06	24 x 30*	36 x 48	—
No Parking (symbol)	R8-3	6F.06	24 x 24	36 x 36	—
Pedestrian Crosswalk	R9-8	6F.13	36 x 18	—	—
Sidewalk Closed	R9-9	6F.14	24 x 12	—	—
Sidewalk Closed, Use Other Side	R9-10	6F.14	24 x 12	—	—
Sidewalk Closed Ahead, Cross Here	R9-11	6F.14	24 x 18	—	—
Sidewalk Closed, Cross Here	R9-11a	6F.14	24 x 12	—	—
Road Closed	R11-2	6F.08	48 x 30	—	—
Road Closed - Local Traffic Only	R11-3a,3b,4	6F.09	60 x 30	—	—
Weight Limit	R12-1,2	6F.10	24 x 30	36 x 48	—
Weight Limit (with symbols)	R12-5	6F.10	24 x 36	36 x 48	—
Turn and Curve Signs	W1-1,2,3,4	6F.16	36 x 36	48 x 48	30 x 30
<del>Reverse Curve (2 or more lanes)</del>	<del>W1-1b,4c</del>	<del>6F.16</del>	<del>36 x 36</del>	<del>48 x 48</del>	<del>30 x 30</del>
One-Direction Large Arrow	W1-6	6F.16	48 x 24	60 x 30	—
Chevron	W1-8	6F.16	18 x 24	30 x 36	—
Stop Ahead	W3-1	6F.16	36 x 36	48 x 48	30 x 30
Yield Ahead	W3-2	6F.16	36 x 36	48 x 48	30 x 30
Signal Ahead	W3-3	6F.16	36 x 36	48 x 48	30 x 30
Be Prepared to Stop	W3-4	6F.16	36 x 36	48 x 48	30 x 30
Reduced Speed Limit Ahead	W3-5	6F.16	36 x 36	48 x 48	30 x 30

(Also see C2(CA) Sign Size)

(See W1-4 Sign Size)

**Table 6F-1. Temporary Traffic Control Zone Sign and Plaque Sizes (Sheet 2 of 3)**

Sign or Plaque	Sign Designation	Section	Conventional Road	Freeway or Expressway	Minimum
XX MPH Speed Zone Ahead	W3-5a	6F.16	36 x 36	48 x 48	30 x 30
Merging Traffic	W4-1,5	6F.16	36 x 36	48 x 48	36 x 36
Lane Ends	W4-2	6F.24	36 x 36	48 x 48	30 x 30
Added Lane	W4-3,6	6F.16	36 x 36	48 x 48	30 x 30
No Merge Area (plaque)	W4-5P	6F.16	18 x 24	24 x 30	—
Road Narrows	W5-1	6F.16	36 x 36	48 x 48	30 x 30
Narrow Bridge	W5-2	6F.16	36 x 36	48 x 48	30 x 30
One Lane Bridge	W5-3	6F.16	36 x 36	48 x 48	30 x 30
<del>Ramp Narrows</del>	<del>W5-4</del>	<del>6F.28</del>	<del>36 x 36</del>	<del>48 x 48</del>	<del>30 x 30</del>
Divided Highway	W6-1	6F.16	36 x 36	48 x 48	30 x 30
Divided Highway Ends	W6-2	6F.16	36 x 36	48 x 48	30 x 30
Two-Way Traffic	W6-3	6F.32	36 x 36	48 x 48	30 x 30
Two-Way Traffic	W6-4	6F.76	12 x 18	12 x 18	—
Hill (symbol)	W7-1	6F.16	36 x 36	48 x 48	30 x 30
Next XX Miles (plaque)	W7-3aP	6F.53	24 x 18	36 x 30	—
Bump	W8-1	6F.16	36 x 36	48 x 48	30 x 30
Dip	W8-2	6F.16	36 x 36	48 x 48	30 x 30
Pavement Ends	W8-3	6F.16	36 x 36	48 x 48	30 x 30
Soft Shoulder	W8-4	6F.44	36 x 36	48 x 48	30 x 30
Slippery When Wet	W8-5	6F.16	36 x 36	48 x 48	30 x 30
Truck Crossing	W8-6	6F.36	36 x 36	48 x 48	30 x 30
Loose Gravel	W8-7	6F.16	36 x 36	48 x 48	30 x 30
Rough Road	W8-8	6F.16	36 x 36	48 x 48	30 x 30
Low Shoulder	W8-9	6F.44	36 x 36	48 x 48	30 x 30
Uneven Lanes	W8-11	6F.45	36 x 36	48 x 48	30 x 30
No Center Line	W8-12	6F.47	36 x 36	48 x 48	30 x 30
Fallen Rocks	W8-14	6F.16	36 x 36	48 x 48	30 x 30
Grooved Pavement	W8-15	6F.16	36 x 36	48 x 48	30 x 30
Motorcycle (plaque)	W8-15P	6F.54	24 x 18	30 x 24	—
Shoulder Drop Off (symbol)	W8-17	6F.44	36 x 36	48 x 48	30 x 30
Shoulder Drop-Off (plaque)	W8-17P	6F.44	24 x 18	30 x 24	—
Road May Flood	W8-18	6F.16	36 x 36	48 x 48	24 x 24
No Shoulder	W8-23	6F.16	36 x 36	48 x 48	30 x 30
Steel Plate Ahead	W8-24	6F.46	36 x 36	48 x 48	30 x 30
Shoulder Ends	W8-25	6F.16	36 x 36	48 x 48	30 x 30
Lane Ends	W9-1	6F.16	36 x 36	48 x 48	30 x 30
Center Lane Closed Ahead	W9-3	6F.23	36 x 36	48 x 48	30 x 30
Grade Crossing Advance Warning	W10-1	6F.16	36 dia.	—	—
Truck	W11-10	6F.36	36 x 36	48 x 48	30 x 30
Double Arrow	W12-1	6F.16	30 x 30	—	—
Low Clearance	W12-2	6F.16	36 x 36	48 x 48	30 x 30
Advisory Speed (plaque)	W13-1P	6F.52	24 x 24	30 x 30	18 x 18
<del>On Ramp (plaque)</del>	<del>W13-4P</del>	<del>6F.25</del>	<del>36 x 36</del>	<del>48 x 48</del>	<del>30 x 30</del>
No Passing Zone (pennant)	W14-3	6F.16	48 x 48 x 36	64 x 64 x 48	40 x 40 x 30
XX Feet (plaque)	W16-2P	6F.16	24 x 18	30 x 24	—
Road Work (with distance)	W20-1	6F.18	36 x 36	48 x 48	30 x 30

(See W5-1 or C12(CA) Sign Sizes)

(See C23(CA) for RAMP WORK AHEAD Sign)

**Table 6F-1. Temporary Traffic Control Zone Sign and Plaque Sizes (Sheet 3 of 3)**

Sign or Plaque	Sign Designation	Section	Conventional Road	Freeway or Expressway	Minimum
Detour (with distance)	W20-2	6F.19	36 x 36	48 x 48	30 x 30
Road (Street) Closed (with distance)	W20-3	6F.20	36 x 36	48 x 48	30 x 30
One Lane Road (with distance)	W20-4	6F.21	36 x 36	48 x 48	30 x 30
Lane(s) Closed (with distance)	W20-5,5a	6F.22	36 x 36	48 x 48	30 x 30
<del>Flagger (symbol)</del>	<del>W20-7</del>	<del>6F.31</del>	<del>36 x 36</del>	<del>48 x 48</del>	<del>30 x 30</del>
Flagger	W20-7a	6F.31	36 x 36	48 x 48	30 x 30
Slow (on Stop/Slow Paddle)	W20-8	6E.03	18 x 18	—	—
Workers	W21-1,1a	6F.33	36 x 36	48 x 48	30 x 30
Fresh Oil (Tar)	W21-2	6F.34	36 x 36	48 x 48	30 x 30
Road Machinery Ahead	W21-3	6F.35	36 x 36	48 x 48	30 x 30
Slow Moving Vehicle	W21-4	6G.06	36 x 18	—	—
Shoulder Work	W21-5	6F.37	36 x 36	48 x 48	30 x 30
Shoulder Closed	W21-5a	6F.37	36 x 36	48 x 48	30 x 30
Shoulder Closed (with distance)	W21-5b	6F.37	36 x 36	48 x 48	30 x 30
Survey Crew	W21-6	6F.38	36 x 36	48 x 48	30 x 30
Utility Work Ahead	W21-7	6F.39	36 x 36	48 x 48	30 x 30
Mowing Ahead	W21-8	6G.06	36 x 36	48 x 48	30 x 30
Blasting Zone Ahead	W22-1	6F.41	36 x 36	48 x 48	30 x 30
Turn Off 2-Way Radio and Cell Phone	W22-2	6F.42	42 x 36	42 x 36	—
End Blasting Zone	W22-3	6F.43	42 x 36	42 x 36	36 x 30
Slow Traffic Ahead	W23-1	6F.27	<del>54 x 30</del> <del>48 x 24</del>	<del>72 x 42</del> <del>48 x 24</del>	48 x 24
New Traffic Pattern Ahead	W23-2	6F.30	36 x 36	48 x 48	30 x 30
Double Reverse Curve (1 lane)	W24-1	6F.49	36 x 36	48 x 48	30 x 30
<del>Double Reverse Curve (2 lanes)</del>	<del>W24-1a</del>	<del>6F.49</del>	<del>36 x 36</del>	<del>48 x 48</del>	<del>30 x 30</del>
<del>Double Reverse Curve (3 lanes)</del>	<del>W24-1b</del>	<del>6F.49</del>	<del>36 x 36</del>	<del>48 x 48</del>	<del>30 x 30</del>
All Lanes	W24-1cP	6F.49	24 x 24	30 x 30	—
Road Work (Construction) Next XX Miles	G20-1	6F.56	<del>60 x 36</del> <del>36 x 18</del>	<del>90 x 48</del> <del>48 x 24</del>	36 x 18
End Road Work	G20-2	6F.57	36 x 18	48 x 24	—
Pilot Car Follow Me	G20-4	6F.58	36 x 18	—	—
Work Zone (plaque)	G20-5aP	6F.12	24 x 18	36 x 24	—
Exit Open	E5-2	6F.28	48 x 36	48 x 36	—
Exit Closed	E5-2a	6F.28	48 x 36	48 x 36	—
Exit Only	E5-3	6F.29	48 x 36	48 x 36	—
Detour	M4-8	6F.59	24 x 12	30 x 15	—
End Detour	M4-8a	6F.59	24 x 18	24 x 18	—
End	M4-8b	6F.59	24 x 12	24 x 12	—
Detour	M4-9	6F.59	30 x 24	48 x 36	—
Bike/Pedestrian Detour	M4-9a	6F.59	30 x 24	—	—
Pedestrian Detour	M4-9b	6F.59	30 x 24	—	—
Bike Detour	M4-9c	6F.59	30 x 24	—	—
Detour	M4-10	6F.59	48 x 18	—	—

(See C19(CA) for RAMP CLOSED Sign)

(Also See C20(CA) Sign Size)

(Also See C9A(CA) Sign Size)

(See W24-1 Sign Size)

(See W24-1 Sign Size)

\* See Table 2B-1 for minimum size required for signs facing traffic on multi-lane conventional roads

- Notes: 1. Larger signs may be used wherever necessary for greater legibility or emphasis  
 2. Dimensions are shown in inches and are shown as width x height

**Table 6F-1(CA). California Temporary Traffic Control Zone Sign and Plaque Sizes**

Sign or Plaque	Sign Designation	Section	Conventional Road (Minimum)	Expressway	Freeway	Oversized
RAMP CLOSED	C2(CA)	6F.28	48 x 30	48 x 30	48 x 30	---
California Flagger Symbol	C9A(CA)	6F.31	36 x 36	48 x 48	48 x 48	---
NARROW LANE(S)	C12(CA)	6F.26, 6F.102(CA)	36 x 36	48 x 48	48 x 48	---
Road Work/Speed Limit	C17(CA)	6F.12	24 x 24	36 x 36	48 x 48	---
RAMP CLOSED AHEAD	C19(CA)	6F.28	36 x 36	48 x 48	48 x 48	---
RIGHT LANE CLOSED AHEAD	C20(CA)	6F.22	36 x 36	48 x 48	48 x 48	72 x 72
LEFT plaque	C20A(CA)	6F.22	16 x 7	19 x 8	19 x 8	33 x 10
Numeral plaque	C20B(CA)	6F.22	6 x 8	8 x 10	8 x 10	10 x 12
RAMP WORK AHEAD	C23(CA)	6F.18	36 x 36	48 x 48	48 x 48	---
ROAD (STREET) WORK Informational plaque	C23B(CA)	6F.18	Var x 18	Var x 24	Var x 24	---
SHOULDER WORK AHEAD	C24(CA)	6F.37	30 x 30	48 x 48	48 x 48	---
OPEN TRENCH	C27(CA)	6F.103(CA)	36 x 36	48 x 48	48 x 48	---
STOP Paddle (not assigned)	C28A(CA)	6E.03, 6E.07, 7D.03, 7D.05	18 x 18	18 x 18	---	24 x 24
SLOW Paddle (not assigned)	C28B(CA)	6E.03, 6E.07	18 x 18	18 x 18	---	24 x 24
XXXX FT	C29(CA)	6F.53	20 x 7	36 x 9	36 x 9	---
LANE CLOSED	C30(CA)	6F.22	30 x 30	48 x 48	48 x 48	---
SHOULDER CLOSED	C30A(CA)	6F.37	30 x 30	48 x 48	48 x 48	---
NO SHOULDER	C31A(CA)	6F.44, 6F.103(CA)	36 x 36	48 x 48	48 x 48	---
TRAFFIC CONTROL - WAIT AND FOLLOW PILOT CAR	C37(CA)	6F.58	36 x 42	36 x 42	---	---
USE NEXT EXIT	C38(CA)	6F.28	---	48 x 36	48 x 36	---
TRAFFIC FINES DOUBLED IN CONSTRUCTION ZONES	C40(CA)	6F.12	108 x 42	144 x 60	144 x 60	---
TRAFFIC FINES DOUBLED IN WORK ZONES	C40A(CA)	6F.12	36 x 36	48 x 48	48 x 48	---
FRESH CONCRETE	C43(CA)	6F.107(CA)	36 x 36	48 x 48	48 x 48	---
TRUCKS ENTERING EXITING	C44(CA)	6F.36	36 x 36	48 x 48	48 x 48	---
DETOUR with Arrow	SC3(CA)	6F.59	36 x 12	48 x 18	48 x 18	---
SPECIAL EVENT AHEAD	SC5(CA)	6F.18	36 x 36	48 x 48	48 x 48	---
RAMP CLOSED (Not more than one day)	SC6-3(CA)	6F.28	48 x 48	48 x 48	48 x 48	---
RAMP CLOSED (More than one day)	SC6-4(CA)	6F.28	48 x 60	48 x 60	48 x 60	---
Day/Month plaque	SC6A(CA)	6F.28	12 x 6	12 x 6	12 x 6	---
Time plaque	SC6B(CA)	6F.28	6 x 6	6 x 6	6 x 6	---
RAMP CLOSED, USE RAMP AT ____	SC7(CA)	6F.28	84 x 42	84 x 42	84 x 42	---
____ EXIT - RAMP CLOSED	SC8(CA)	6F.28	---	84 x 42	84 x 42	---
(FWY) DETOUR with Arrow	SC9(CA)	6F.59	36 x 36	48 x 48	48 x 48	---
LANE CLOSED AHEAD or ROAD WORK AHEAD	SC10(CA)	6F.104(CA)	48 x 30	66 x 36	66 x 36	---
LANE CLOSED	SC11(CA)	6F.104(CA)	42 x 30	54 x 42	54 x 42	---
DO NOT PASS	SC13(CA)	6F.104(CA)	42 x 30	54 x 42	54 x 42	---
CAUTION	SC15(CA)	6F.104(CA)	42 x 18	54 x 24	54 x 24	---
EXIT with Arrow	SC18(CA)	6F.28	---	48 x 48	48 x 48	---
Slow For The Cone Zone	SC19(CA)	6F.106(CA)	54 x 36	54 x 36	54 x 36	114 x 78
SLOW FOR THE CONE ZONE	SC20(CA)	6F.106(CA)	36 x 36	48 x 48	48 x 48	---
CAUTION FREQUENT STOPPING AND BACKING STAY BACK 100 FEET	SC21(CA)	6F.108(CA)	30 x 42	30 x 42	30 x 42	---

**Table 6F-101(CA). Maximum Spacing of Channelizing Devices**

Speed (mph)	Maximum Channelizing Devices Spacing		
	Taper* (feet)	Tangent (feet)	Conflict** (feet)
20	20	40	10
25	25	50	12
30	30	60	15
35	35	70	17
40	40	80	20
45	45	90	22
50	50	100	25
55	55	110	27
60	60	120	30
65	65	130	32
70	70	140	35

\* Maximum channelizing device spacing for all speeds on one-lane/two-way tapers is 20 feet.

Maximum channelizing device spacing for all speeds on downstream tapers is 20 feet.

All other tapers are as shown.

\*\* Use on intermediate and short-term projects for taper and tangent sections where there are no pavement markings or where there is a conflict between existing pavement markings and channelizers (CA)



## CHAPTER 6G. TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES

### Section 6G.01 Typical Applications

**Support:**

01 Each TTC zone is different. Many variables, such as location of work, highway type, geometrics, vertical and horizontal alignment, intersections, interchanges, road user volumes, road vehicle mix (buses, trucks, and cars), and road user speeds affect the needs of each zone. The goal of TTC in work zones is safety with minimum disruption to road users. The key factor in promoting TTC zone safety is proper judgment.

02 Typical applications (TAs) of TTC zones are organized according to duration, location, type of work, and highway type. Table 6H-1 is an index of these typical applications. These typical applications include the use of various TTC methods, but do not include a layout for every conceivable work situation.

03 Well-designed TTC plans for planned special events will likely be developed from a combination of treatments from several of the typical applications.

**Guidance:**

04 *For any planned special event that will have an impact on the traffic on any street or highway, a TTC plan should be developed in conjunction with and be approved by the agency or agencies that have jurisdiction over the affected roadways.*

05 *Typical applications should be altered, when necessary, to fit the conditions of a particular TTC zone.*

**Option:**

06 Other devices may be added to supplement the devices shown in the typical applications, while others may be deleted. The sign spacings and taper lengths may be increased to provide additional time or space for driver response.

**Support:**

07 Decisions regarding the selection of the most appropriate typical application to use as a guide for a specific TTC zone require an understanding of each situation. Although there are many ways of categorizing TTC zone applications, the four factors mentioned earlier (work duration, work location, work type, and highway type) are used to characterize the typical applications illustrated in Chapter 6H.

### Section 6G.02 Work Duration

**Support:**

01 Work duration is a major factor in determining the number and types of devices used in TTC zones. The duration of a TTC zone is defined relative to the length of time a work operation occupies a spot location.

**Standard:**

02 **The five categories of work duration and their time at a location shall be:**

**A. Long-term stationary is work that occupies a location more than 3 days.**

**B. Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.**

**C. Short-term stationary is daytime work that occupies a location for more than 1 hour within a single daylight period.**

**D. Short duration is work that occupies a location up to 1 hour.**

**E. Mobile is work that moves intermittently or continuously.**

**Support:**

03 At long-term stationary TTC zones, there is ample time to install and realize benefits from the full range of TTC procedures and devices that are available for use. Generally, larger channelizing devices, temporary roadways, and temporary traffic barriers are used.

**Standard:**

04 **Since long-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in long-term stationary TTC zones.**

**Guidance:**

05 *Inappropriate markings in long-term stationary TTC zones should be removed and replaced with temporary markings.*

Support:

06 In intermediate-term stationary TTC zones, it might not be feasible or practical to use procedures or devices that would be desirable for long-term stationary TTC zones, such as altered pavement markings, temporary traffic barriers, and temporary roadways. The increased time to place and remove these devices in some cases could significantly lengthen the project, thus increasing exposure time.

**Standard:**

**07 Since intermediate-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in intermediate-term stationary TTC zones.**

Support:

08 Most maintenance and utility operations are short-term stationary work.

09 As compared to stationary operations, mobile and short-duration operations are activities that might involve different treatments. Devices having greater mobility might be necessary such as signs mounted on trucks. Devices that are larger, more imposing, or more visible can be used effectively and economically. The mobility of the TTC zone is important.

*Guidance:*

10 *Safety in short-duration or mobile operations should not be compromised by using fewer devices simply because the operation will frequently change its location.*

Option:

11 Appropriately colored or marked vehicles with high-intensity rotating, flashing, oscillating, or strobe lights may be used in place of signs and channelizing devices for short-duration or mobile operations. These vehicles may be augmented with signs or arrow boards.

Support:

12 During short-duration work, it often takes longer to set up and remove the TTC zone than to perform the work. Workers face hazards in setting up and taking down the TTC zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.

Option:

13 Considering these factors, simplified control procedures may be warranted for short-duration work. A reduction in the number of devices may be offset by the use of other more dominant devices such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles.

Support:

14 Mobile operations often involve frequent short stops for activities such as litter cleanup, pothole patching, or utility operations, and are similar to short-duration operations.

*Guidance:*

15 *Warning signs and high-intensity rotating, flashing, oscillating, or strobe lights should be used on the vehicles that are participating in the mobile work.*

Option:

16 Flags and/or channelizing devices may additionally be used and moved periodically to keep them near the mobile work area.

17 Flaggers may be used for mobile operations that often involve frequent short stops.

Support:

18 Mobile operations also include work activities where workers and equipment move along the road without stopping, usually at slow speeds. The advance warning area moves with the work area.

*Guidance:*

19 *When mobile operations are being performed, a shadow vehicle equipped with an arrow board or a sign should follow the work vehicle, especially when vehicular traffic speeds or volumes are high. Where feasible, warning signs should be placed along the roadway and moved periodically as work progresses.*

20 *Under high-volume conditions, consideration should be given to scheduling mobile operations work during off-peak hours.*

21 *If there are mobile operations on a high-speed travel lane of a multi-lane divided highway, arrow boards and/or Portable Changeable Message Signs should be used.*

**Standard:**

**<sup>22</sup> Mobile operations shall have appropriate devices on the equipment (that is, high-intensity rotating, flashing, oscillating, or strobe lights, signs, or special lighting), or shall use a separate vehicle with appropriate warning devices.**

**Option:**

<sup>23</sup> For mobile operations that move at speeds of less than 3 mph, mobile signs or stationary signing that is periodically retrieved and repositioned in the advance warning area may be used.

**Section 6G.03 Location of Work**

**Support:**

<sup>01</sup> Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

<sup>02</sup> The choice of TTC needed for a TTC zone depends upon where the work is located. As a general rule, the closer the work is to road users (including bicyclists and pedestrians), the greater the number of TTC devices that are needed. Procedures are described later in this Chapter for establishing TTC zones in the following locations:

- A. Outside the shoulder,
- B. On the shoulder with no encroachment,
- C. On the shoulder with minor encroachment,
- D. Within the median, and
- E. Within the traveled way.

**Standard:**

**<sup>03</sup> When the work space is within the traveled way, except for short-duration and mobile operations, advance warning shall provide a general message that work is taking place and shall supply information about highway conditions. TTC devices shall indicate how vehicular traffic can move through the TTC zone.**

**Section 6G.04 Modifications To Fulfill Special Needs**

**Support:**

<sup>01</sup> The typical applications in Chapter 6H illustrate commonly encountered situations in which TTC devices are employed.

**Option:**

<sup>02</sup> Other devices may be added to supplement the devices provided in the typical applications, and device spacing may be adjusted to provide additional reaction time. When conditions are less complex than those depicted in the typical applications, fewer devices may be needed.

**Guidance:**

<sup>03</sup> *When conditions are more complex, typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6B and by incorporating appropriate devices and practices from the following list:*

*A. Additional devices:*

- 1. Signs*
- 2. Arrow boards*
- 3. More channelizing devices at closer spacing (see Section 6F.74 for information regarding detectable edging for pedestrians)*
- 4. Temporary raised pavement markers*
- 5. High-level warning devices*
- 6. Portable changeable message signs*
- 7. Temporary traffic control signals (including pedestrian signals and accessible pedestrian signals)*
- 8. Temporary traffic barriers*
- 9. Crash cushions*
- 10. Screens*
- 11. Rumble strips*
- 12. More delineation*

- B. *Upgrading of devices:*
  - 1. *A full complement of standard pavement markings*
  - 2. *Brighter and/or wider pavement markings*
  - 3. *Larger and/or brighter signs*
  - 4. *Channelizing devices with greater conspicuity*
  - 5. *Temporary traffic barriers in place of channelizing devices*
- C. *Improved geometrics at detours or crossovers*
- D. *Increased distances:*
  - 1. *Longer advance warning area*
  - 2. *Longer tapers*
- E. *Lighting:*
  - 1. *Temporary roadway lighting*
  - 2. *Steady-burn lights used with channelizing devices*
  - 3. *Flashing lights for isolated hazards*
  - 4. *Illuminated signs*
  - 5. *Floodlights*
- F. *Pedestrian routes and temporary facilities*
- G. *Bicycle diversions and temporary facilities*

### **Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities**

#### **Support:**

<sup>01</sup> It is not uncommon, particularly in urban areas, that road work and the associated TTC will affect existing pedestrian or bicycle facilities. It is essential that the needs of all road users, including pedestrians with disabilities, are considered in TTC zones.

<sup>02</sup> In addition to specific provisions identified in Sections 6G.06 through 6G.14, there are a number of provisions that might be applicable for all of the types of activities identified in this Chapter.

#### **Guidance:**

<sup>03</sup> *Where pedestrian or bicycle usage is high, the typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6D, this Chapter, Section 6F.74, and in other Sections of Part 6 related to accessibility and detectability provisions in TTC zones.*

<sup>04</sup> *Pedestrians should be separated from the worksite by appropriate devices that maintain the accessibility and detectability for pedestrians with disabilities.*

<sup>05</sup> *Bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.*

<sup>06</sup> *Except for short duration and mobile operations, when a highway shoulder is occupied, a SHOULDER WORK (W21-5) sign, a SHOULDER CLOSED C30A(CA) sign, or other similar signs should be placed in advance of the activity area. When work is performed on a paved shoulder 8 feet or more in width, channelizing devices should be placed on a taper having a length that conforms to the requirements of a shoulder taper. Signs should be placed such that they do not narrow any existing pedestrian passages to less than 48 inches.*

<sup>06a</sup> *When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (see Section 6G.02), information and devices contained in Figures 6H-101(CA) through 6H-104(CA), as appropriate per situation encountered, should be used in order to replicate existing conditions for the needs and control of bicyclists through a TTC zone.*

<sup>06b</sup> *Except for short durations and mobile operations (see Section 6G.02), when a highway shoulder is occupied and bicyclists would be sharing a lane with vehicular traffic, as a result of the TTC zone, a combination of Bicycle crossing (W11-1) and SHARE THE ROAD (W16-1P) plaque should be placed in advance of the activity area. When work is performed on a paved shoulder 8 feet or more in width, channelizing devices should be placed on a taper having a length that conforms to the requirements of a shoulder taper. Signs should be placed such that they do not block the bicyclist's path of travel and they do not narrow any existing pedestrian passages to less than 48 inch.*

<sup>07</sup> *Pedestrian detours should be avoided since pedestrians rarely observe them and the cost of providing accessibility and detectability might outweigh the cost of maintaining a continuous route. Whenever possible,*

*work should be done in a manner that does not create a need to detour pedestrians from existing routes or crossings.*

**Standard:**

**<sup>08</sup> Where pedestrian routes are closed, alternate pedestrian routes shall be provided.**

**<sup>09</sup> When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.**

**Option:**

<sup>10</sup> If establishing or maintaining an alternate pedestrian route is not feasible during the project, an alternate means of providing for pedestrians may be used, such as adding free bus service around the project or assigning a person the responsibility to assist pedestrians with disabilities through the project limits. See Section 6D.01 for details.

**Section 6G.06 Work Outside of the Shoulder**

**Support:**

<sup>01</sup> When work is being performed off the roadway (beyond the shoulders, but within the right-of-way), little or no TTC might be needed. TTC generally is not needed where work is confined to an area 15 feet or more from the edge of the traveled way. However, TTC is appropriate where distracting situations exist, such as vehicles parked on the shoulder, vehicles accessing the worksite via the highway, and equipment traveling on or crossing the roadway to perform the work operations (for example, mowing). For work beyond the shoulder, see Figure 6H-1.

**Guidance:**

<sup>02</sup> *Where the situations described in Paragraph 1 exist, a single warning sign, such as ROAD WORK AHEAD (W20-1) or Workers (W21-1a) sign, should be used. If the equipment travels on the roadway, the equipment should be equipped with appropriate flags, high-intensity rotating, flashing, oscillating, or strobe lights, and/or a SLOW MOVING VEHICLE (W21-4) sign.*

**Option:**

<sup>03</sup> If work vehicles are on the shoulder, a SHOULDER WORK (W21-5) sign may be used. For mowing operations, the sign MOWING AHEAD (W21-8) may be used.

<sup>04</sup> Where the activity is spread out over a distance of more than 2 miles, the SHOULDER WORK (W21-5) sign may be repeated every 1 mile.

<sup>05</sup> A supplementary plaque with the message NEXT XX MILES (W7-3aP) may be used.

**Guidance:**

<sup>06</sup> *A general warning sign like ROAD MACHINERY AHEAD (W21-3) should be used if workers and equipment must occasionally move onto the shoulder.*

**Section 6G.07 Work on the Shoulder with No Encroachment**

**Support:**

<sup>01</sup> The provisions of this Section apply to short-term through long-term stationary operations.

**Standard:**

**<sup>02</sup> When paved shoulders having a width of 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct motor vehicle traffic to remain within the traveled way.**

**Guidance:**

<sup>03</sup> *When paved shoulders having a width of 8 feet or more are closed on freeways and expressways, road users should be warned about potential disabled vehicles that cannot get off the traveled way. An initial general warning sign, such as ROAD WORK AHEAD (W20-1), should be used, followed by a RIGHT or LEFT SHOULDER CLOSED (W21-5a) sign. Where the downstream end of the shoulder closure extends beyond the distance that can be perceived by road users, a supplementary plaque bearing the message NEXT XX FEET (W16-4P) or MILES (W7-3aP) should be placed below the SHOULDER CLOSED (W21-5a) sign. On multi-lane, divided highways, signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.*

*04 When an improved shoulder is closed on a high-speed roadway, it should be treated as a closure of a portion of the road system because road users expect to be able to use it in emergencies. Road users should be given ample advance warning that shoulders are closed for use as refuge areas throughout a specified length of the approaching TTC zone. The sign(s) should read SHOULDER CLOSED (W21-5a) with distances indicated. The work space on the shoulder should be closed off by a taper or channelizing devices with a length of 1/3 L using the formulas in Tables 6C-3, 6C-3(CA) and 6C-4.*

*05 When the shoulder is not occupied but work has adversely affected its condition, the LOW SHOULDER (W8-9) or SOFT SHOULDER (W8-4) sign should be used, as appropriate.*

*06 Where the condition extends over a distance in excess of 1 mile, the sign should be repeated at 1-mile intervals.*

Option:

*07 In addition, a supplementary plaque bearing the message NEXT XX MILES (W7-3aP) may be used. Temporary traffic barriers may be needed to inhibit encroachment of errant vehicles into the work space and to protect workers.*

**Standard:**

**08 When used for shoulder work, arrow boards shall operate only in the caution mode.**

Support:

*09 A typical application for stationary work operations on shoulders is shown in Figure 6H-3. Short duration or mobile work on shoulders is shown in Figure 6H-4 6H-4(CA). Work on freeway shoulders is shown in Figure 6H-5 6H-5(CA).*

### **Section 6G.08 Work on the Shoulder with Minor Encroachment**

Support:

*01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.*

*Guidance:*

*02 When work takes up part of a lane, vehicular traffic volumes, vehicle mix (buses, trucks, cars, and bicycles), speed, and capacity should be analyzed to determine whether the affected lane should be closed. Unless the lane encroachment permits a remaining lane width of 10 feet, the lane should be closed.*

*03 Truck off-tracking should be considered when determining whether the minimum lane width of 10 feet is adequate.*

Option:

*04 Except on state highways a lane width of 9 feet may be used for short-term stationary work on low-volume, low-speed roadways when vehicular traffic does not include longer and wider heavy commercial vehicles.*

Support:

*05 Figure 6H-6 illustrates a method for handling vehicular traffic where the stationary or short duration work space encroaches slightly into the traveled way.*

### **Section 6G.09 Work Within the Median**

Support:

*01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.*

*Guidance:*

*02 If work in the median of a divided highway is within 15 feet from the edge of the traveled way for either direction of travel, TTC should be used through the use of advance warning signs and channelizing devices.*

### **Section 6G.10 Work Within the Traveled Way of a Two-Lane Highway**

Support:

*01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.*

*02 Detour signs are used to direct road users onto another roadway. At diversions, road users are directed onto a temporary roadway or alignment placed within or adjacent to the right-of-way. Typical applications for detouring*

or diverting road users on two-lane highways are shown in Figures 6H-7, 6H-8, and 6H-9. Figure 6H-7 illustrates the controls around an area where a section of roadway has been closed and a diversion has been constructed. Channelizing devices and pavement markings are used to indicate the transition to the temporary roadway.

*Guidance:*

<sup>03</sup> *When a detour is long, Detour (M4-8, M4-9) signs should be installed to remind and reassure road users periodically that they are still successfully following the detour.*

<sup>04</sup> *When an entire roadway is closed, as illustrated in Figure 6H-8, a detour should be provided and road users should be warned in advance of the closure, which in this example is a closure 10 miles from the intersection. If local road users are allowed to use the roadway up to the closure, the ROAD CLOSED AHEAD, LOCAL TRAFFIC ONLY (R11-3a) sign should be used. The portion of the road open to local road users should have adequate signing, marking, and delineation.*

<sup>05</sup> *Detours should be signed so that road users will be able to traverse the entire detour route and back to the original roadway as shown in Figure 6H-9.*

**Support:**

<sup>06</sup> Techniques for controlling vehicular traffic under one-lane, two-way conditions are described in Section 6C.10.

**Option:**

<sup>07</sup> Flagger may be used as shown in Figure ~~6H-10~~ 6H-10(CA).

<sup>08</sup> STOP/YIELD sign control may be used on roads with low traffic volumes as shown in Figure 6H-11.

<sup>09</sup> A temporary traffic control signal may be used as shown in Figure 6H-12.

**Support:**

<sup>10</sup> Refer to CVC 21363 for detour signs.

## **Section 6G.11 Work Within the Traveled Way of an Urban Street**

**Support:**

<sup>01</sup> Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

<sup>02</sup> In urban TTC zones, decisions are needed on how to control vehicular traffic, such as how many lanes are required, whether any turns need to be prohibited at intersections, and how to maintain access to business, industrial, and residential areas.

<sup>03</sup> Pedestrian traffic needs separate attention. Chapter 6D contains information regarding pedestrian movements near TTC zones.

**Standard:**

<sup>04</sup> **If the TTC zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided (see Part 9).**

<sup>05</sup> **Where transit stops are affected or relocated because of work activity, both pedestrian and vehicular access to the affected or relocated transit stops shall be provided.**

*Guidance:*

<sup>06</sup> *If a designated bicycle route is closed because of the work being done, a signed alternate route should be provided. Bicyclists should not be directed onto the path used by pedestrians.*

<sup>07</sup> *Worksites within the intersection should be protected against inadvertent pedestrian incursion by providing detectable channelizing devices.*

**Support:**

<sup>08</sup> Utility work takes place both within and outside the roadway to construct and maintain services such as power, gas, light, water, or telecommunications. Operations often involve intersections, since that is where many of the network junctions occur. The work force is usually small, only a few vehicles are involved, and the number and types of TTC devices placed in the TTC zone is usually minimal.

**Standard:**

<sup>09</sup> **All TTC devices shall be retroreflective or illuminated if utility work is performed during nighttime hours.**

*Guidance:*

<sup>10</sup> As discussed under short-duration projects, however, the reduced number of devices in utility work zones should be offset by the use of high-visibility devices, such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles or high-level warning devices.

**Support:**

<sup>11</sup> Figures 6H-6, ~~6H-10~~ 6H-10(CA), 6H-15, 6H-18, 6H-21, 6H-22, 6H-22A(CA), 6H-22B(CA), 6H-23, 6H-26, and 6H-33 are examples of typical applications for utility operations. Other typical applications might apply as well.

**Section 6G.12 Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway**

**Support:**

<sup>01</sup> Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

<sup>02</sup> Work on multi-lane (two or more lanes of moving motor vehicle traffic in one direction) highways is divided into right-lane closures, left-lane closures, interior-lane closures, multiple-lane closures, and closures on five-lane roadways.

**Standard:**

<sup>03</sup> **When a lane is closed on a multi-lane road for other than a mobile operation, a transition area containing a merging taper shall be used.**

*Guidance:*

<sup>04</sup> When justified by an engineering study, temporary traffic barriers (see Section 6F.70) should be used to prevent incursions of errant vehicles into hazardous areas or work space.

**Support:**

<sup>05</sup> Figure 6H-34 illustrates a lane closure in which temporary traffic barriers are used.

**Option:**

<sup>06</sup> When the right lane is closed, TTC similar to that shown in Figure 6H-33 may be used for undivided or divided four-lane roads.

*Guidance:*

<sup>07</sup> If morning and evening peak hour vehicular traffic volumes in the two directions are uneven and the greater volume is on the side where the work is being done in the right-hand lane, consideration should be given to closing the inside lane for opposing vehicular traffic and making the lane available to the side with heavier vehicular traffic, as shown in Figure 6H-31.

<sup>08</sup> If the larger vehicular traffic volume changes to the opposite direction at a different time of the day, the TTC should be changed to allow two lanes for opposing vehicular traffic by moving the devices from the opposing lane to the center line. When it is necessary to create a temporary center line that is not consistent with the pavement markings, channelizing devices should be used and closely spaced.

**Option:**

<sup>09</sup> When closing a left lane on a multi-lane undivided road, as vehicular traffic flow permits, the two interior lanes may be closed, as shown in Figure 6H-30, to provide drivers and workers additional lateral clearance and to provide access to the work space.

**Standard:**

<sup>10</sup> **When only the left lane is closed on undivided roads, channelizing devices shall be placed along the center line as well as along the adjacent lane.**

*Guidance:*

<sup>11</sup> When an interior lane is closed, an adjacent lane should also be considered for closure to provide additional space for vehicles and materials and to facilitate the movement of equipment within the work space.

<sup>12</sup> When multiple lanes in one direction are closed, a capacity analysis should be made to determine the number of lanes needed to accommodate motor vehicle traffic needs. Vehicular traffic should be moved over one lane at a time. As shown in Figure 6H-37, the tapers should be separated by a distance of 2L, with L being determined by the formulas in Tables 6C-3, 6C-3(CA) and 6C-4.

**Option:**

<sup>13</sup> If operating speeds are 40 mph or less and the space approaching the work area does not permit moving traffic over one lane at a time, a single continuous taper may be used.

**Standard:**

**14 When a directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices at intersections within the temporary two-lane, two-way operations section shall be covered, removed, or obliterated.**

**Option:**

15 When half the road is closed on an undivided highway, both directions of vehicular traffic may be accommodated as shown in Figure ~~6H-32~~ 6H-32(CA). When both interior lanes are closed, temporary traffic controls may be used as provided in Figure 6H-30. When a roadway must be closed on a divided highway, a median crossover may be used (see Section 6G.16).

**Support:**

16 TTC for lane closures on five-lane roads is similar to other multi-lane undivided roads. Figure ~~6H-32~~ 6H-32(CA) can be adapted for use on five-lane roads. Figure 6H-35 can be used on a five-lane road for short duration and mobile operations.

**Section 6G.13 Work Within the Traveled Way at an Intersection**

**Support:**

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 The typical applications for intersections are classified according to the location of the work space with respect to the intersection area (as defined by the extension of the curb or edge lines). The three classifications are near side, far side, and in-the-intersection. Work spaces often extend into more than one portion of the intersection. For example, work in one quadrant often creates a near-side work space on one street and a far-side work space on the cross street. In such instances, an appropriate TTC plan is obtained by combining features shown in two or more of the intersection and pedestrian typical applications.

03 TTC zones in the vicinity of intersections might block movements and interfere with normal road user flows. Such conflicts frequently occur at more complex signalized intersections having such features as traffic signal heads over particular lanes, lanes allocated to specific movements, multiple signal phases, signal detectors for actuated control, and accessible pedestrian signals and detectors.

**Guidance:**

04 *The effect of the work upon signal operation should be considered, and temporary corrective actions should be taken, if necessary, such as revising signal phasing and/or timing to provide adequate capacity, maintaining or adjusting signal detectors, and relocating signal heads to provide adequate visibility as described in Part 4.*

**Standard:**

**05 When work will occur near an intersection where operational, capacity, or pedestrian accessibility problems are anticipated, the highway agency having jurisdiction shall be contacted.**

**Guidance:**

06 *For work at an intersection, advance warning signs, devices, and markings should be used on all cross streets, as appropriate. The typical applications depict urban intersections on arterial streets. Where the posted speed limit, the off-peak 85th-percentile speed prior to the work starting, or the anticipated speed exceeds 40 mph, additional warning signs should be used in the advance warning area.*

07 *Pedestrian crossings near TTC sites should be separated from the worksite by appropriate barriers that maintain the accessibility and detectability for pedestrians with disabilities.*

**Support:**

08 Near-side work spaces, as depicted in Figure 6H-21, are simply handled as a midblock lane closure. A problem that might occur with near-side lane closure is a reduction in capacity, which during certain hours of operation could result in congestion and backups.

**Option:**

09 When near-side work spaces are used, an exclusive turn lane may be used for through vehicular traffic.

10 Where space is restricted in advance of near-side work spaces, as with short block spacings, two warning signs may be used in the advance warning area, and a third action-type warning or a regulatory sign (such as Keep Left) may be placed within the transition area.

Support:

<sup>11</sup> Far-side work spaces, as depicted in Figures 6H-22 through 6H-25, involve additional treatment because road users typically enter the activity area by straight-through and left- or right-turning movements.

Guidance:

<sup>12</sup> *When a lane through an intersection must be closed on the far side, it should also be closed on the near-side approach to preclude merging movements within the intersection.*

Option:

<sup>13</sup> If there are a significant number of vehicles turning from a near-side lane that is closed on the far side, the near-side lane may be converted to an exclusive turn lane.

Support:

<sup>14</sup> Figures 6H-26 and 6H-27 provide guidance on applicable procedures for work performed within the intersection.

Option:

<sup>15</sup> If the work is within the intersection, any of the following strategies may be used:

- A. A small work space so that road users can move around it, as shown in Figure 6H-26;
- B. Flaggers or uniformed law enforcement officers to direct road users, as shown in Figure 6H-27;
- C. Work in stages so the work space is kept to a minimum; and
- D. Road closures or upstream diversions to reduce road user volumes.

Guidance:

<sup>16</sup> *Depending on road user conditions, a flagger(s) and/or a uniformed law enforcement officer(s) should be used to control road users.*

## **Section 6G.14 Work Within the Traveled Way of a Freeway or Expressway**

Support:

<sup>01</sup> Problems of TTC might occur under the special conditions encountered where vehicular traffic must be moved through or around TTC zones on high-speed, high-volume roadways. Although the general principles outlined in the previous Sections of this Manual are applicable to all types of highways, high-speed, access-controlled highways need special attention in order to accommodate vehicular traffic while also protecting road users and workers. The road user volumes, road vehicle mix (buses, trucks, cars, and bicycles, if permitted), and speed of vehicles on these facilities require that careful TTC procedures be implemented, for example, to induce critical merging maneuvers well in advance of work spaces and in a manner that creates minimum turbulence and delay in the vehicular traffic stream. These situations often require more conspicuous devices than specified for normal rural highway or urban street use. However, the same important basic considerations of uniformity and standardization of general principles apply for all roadways.

<sup>02</sup> Work under high-speed, high-volume vehicular traffic on a controlled access highway is complicated by the roadway design and operational features. The presence of a median that establishes separate roadways for directional vehicular traffic flow might prohibit the closing of one of the roadways or the diverting of vehicular traffic to the other roadway. Lack of access to and from adjacent roadways prohibits rerouting of vehicular traffic away from the work space in many cases. Other conditions exist where work must be limited to night hours, thereby necessitating increased use of warning lights, illumination of work spaces, and advance warning systems.

<sup>03</sup> TTC for a typical lane closure on a divided highway is shown in Figure 6H-33. Temporary traffic controls for short duration and mobile operations on freeways are shown in Figure 6H-35. A typical application for shifting vehicular traffic lanes around a work space is shown in Figure ~~6H-36~~ [6H-36\(CA\)](#). TTC for multiple ~~and interior~~ lane closures on a freeway is shown in Figures 6H-37 and ~~6H-38~~ [Department of Transportation's Standard Plan T10](#). [See Section 1A.11 for information regarding this publication.](#)

Guidance:

<sup>04</sup> ~~The method for closing an interior lane when the open lanes have the capacity to carry vehicular traffic should be as shown in Figure 6H-37. When the capacity of the other lanes is needed, the method shown in Figure 6H-38 should be used.~~

Support:

<sup>05</sup> [The temporary traffic controls for short duration and mobile operations on State highways are shown in Department of Transportation's Standard Plans T15, T16 and T17.](#)

<sup>06</sup> A typical layout of closing lanes to direct traffic around a workspace is shown in Department of Transportation's Standard Plan T10.

<sup>07</sup> See Section 1A.11 for information regarding this publication.

### **Section 6G.15 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway**

Support:

<sup>01</sup> Two-lane, two-way operation on one roadway of a normally divided highway is a typical procedure that requires special consideration in the planning, design, and work phases, because unique operational problems (for example, increasing the risk of head-on crashes) can arise with the two-lane, two-way operation.

**Standard:**

<sup>02</sup> **When two-lane, two-way traffic control must be maintained on one roadway of a normally divided highway, opposing vehicular traffic shall be separated with either temporary traffic barriers (concrete safety-shape or approved alternate), channelizing devices, or a temporary raised island throughout the length of the two-way operation. The use of markings and complementary signing, by themselves, shall not be used.**

Support:

<sup>03</sup> Figure 6H-39 shows the procedure for two-lane, two-way operation. Treatments for entrance and exit ramps within the two-way roadway segment of this type of work are shown in Figures 6H-40 and 6H-41.

Support:

<sup>04</sup> A temporary traffic control zone in the entrance and exit ramps may be handled as shown in Department of Transportation's Standard Plans T10A and T14. See Section 1A.11 for information regarding this publication.

### **Section 6G.16 Crossovers**

*Guidance:*

<sup>01</sup> *The following are considered good guiding principles for the design of crossovers:*

*A. Tapers for lane drops should be separated from the crossovers, as shown in Figure 6H-39.*

*B. Crossovers should be designed for speeds no lower than 10 mph below the posted speed, the off-peak 85th-percentile speed prior to the work starting, or the anticipated operating speed of the roadway, unless unusual site conditions require that a lower design speed be used.*

*C. A good array of channelizing devices, delineators, and full-length, properly placed pavement markings should be used to provide drivers with a clearly defined travel path.*

*D. The design of the crossover should accommodate all vehicular traffic, including trucks and buses.*

Support:

<sup>02</sup> Temporary traffic barriers and the excessive use of TTC devices cannot compensate for poor geometric and roadway cross-section design of crossovers.

### **Section 6G.17 Interchanges**

*Guidance:*

<sup>01</sup> *Access to interchange ramps on limited-access highways should be maintained even if the work space is in the lane adjacent to the ramps. Access to exit ramps should be clearly marked and delineated with channelizing devices. For long-term projects, conflicting pavement markings should be removed and new ones placed. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur before ramp closings.*

Option:

<sup>02</sup> If access is not possible, ramps may be closed by using signs and Type 3 Barricades. As the work space changes, the access area may be changed, as shown in Figure 6H-42. A TTC zone in the exit ramp may be handled as shown in Figure 6H-43.

<sup>03</sup> When a work space interferes with an entrance ramp, a lane may need to be closed on the freeway (see Figure 6H-44). A TTC zone in the entrance ramp may require shifting ramp vehicular traffic (see Figure 6H-44).

Option:

<sup>04</sup> A temporary traffic control zone in the entrance and exit ramps may be handled as shown in Department of Transportation's Standard Plans T10A and T14. See Section 1A.11 for information regarding this publication.

## **Section 6G.18 Work in the Vicinity of a Grade Crossing**

### **Standard:**

**01 When grade crossings exist either within or in the vicinity of a TTC zone, lane restrictions, flagging, or other operations shall not create conditions where vehicles can be queued across the tracks. If the queuing of vehicles across the tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.**

### **Support:**

02 Figure 6H-46 shows work in the vicinity of a grade crossing.

03 Section 8A.08 contains additional information regarding temporary traffic control zones in the vicinity of grade crossings.

### **Guidance:**

04 *Early coordination with the railroad company or light rail transit agency should occur before work starts.*

## **Section 6G.19 Temporary Traffic Control During Nighttime Hours**

### **Support:**

01 Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

02 Conducting highway construction and maintenance activities during night hours could provide an advantage when traditional daytime traffic control strategies cannot achieve an acceptable balance between worker and public safety, traffic and community impact, and constructability. The two basic advantages of working at night are reduced traffic congestion and less involvement with business activities. However, the two basic conditions that must normally be met for night work to offer any advantage are reduced traffic volumes and easy set up and removal of the traffic control patterns on a nightly basis.

03 Shifting work activities to night hours, when traffic volumes are lower and normal business is less active, might offer an advantage in some cases, as long as the necessary work can be completed and the worksite restored to essentially normal operating conditions to carry the higher traffic volume during non-construction hours.

04 Although working at night might offer advantages, it also includes safety issues. Reduced visibility inherent in night work impacts the performance of both drivers and workers. Because traffic volumes are lower and congestion is minimized, speeds are often higher at night necessitating greater visibility at a time when visibility is reduced. Finally, the incidence of impaired (alcohol or drugs), fatigued, or drowsy drivers might be higher at night.

05 Working at night also involves other factors, including construction productivity and quality, social impacts, economics, and environmental issues. A decision to perform construction or maintenance activities at night normally involves some consideration of the advantages to be gained compared to the safety and other issues that might be impacted.

### **Guidance:**

06 *Considering the safety issues inherent to night work, consideration should be given to enhancing traffic controls (see Section 6G.04) to provide added visibility and driver guidance, and increased protection for workers.*

07 *In addition to the enhancements listed in Section 6G.04, consideration should be given to providing additional lights and retroreflective markings to workers, work vehicles, and equipment.*

### **Option:**

08 Where reduced traffic volumes at night make it feasible, the entire roadway may be closed by detouring traffic to alternate facilities, thus removing the traffic risk from the activity area.

### **Guidance:**

09 *Consideration should be given to stationing uniformed law enforcement officers and lighted patrol cars at night work locations where there is a concern that high speeds or impaired drivers might result in undue risks for workers or other drivers.*

**Standard:**

**<sup>10</sup> Except in emergencies, temporary lighting shall be provided at all flagger stations.**

**Support:**

<sup>10a</sup> Refer to Construction Safety Order in the California Code of Regulations (Title 8, Division 1, Chapter 4, Subchapter 4, Article 11, Section 1599 - Flaggers). See Section 1A.11 for information regarding this publication.

**Support:**

<sup>11</sup> Desired illumination levels vary depending upon the nature of the task involved. ~~An average horizontal luminance of 5 foot candles can be adequate for general activities.~~ An average horizontal luminance of 10 foot candles can be adequate for **general activities and** activities around equipment. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 20 foot candles.

**Standard:**

**<sup>12</sup> Highway construction work lighting shall be as per Construction Safety Order 1523 (California Code of Regulations Title 8, Division 1, Chapter 4, Subchapter 4, Article 3, Section 1523 - Illumination). See Section 1A.11 for information regarding this publication.**



## CHAPTER 6H. TYPICAL APPLICATIONS

### Section 6H.01 Typical Applications

#### Support:

01 Chapter 6G contains discussions of typical TTC activities. This Chapter presents typical applications for a variety of situations commonly encountered. While not every situation is addressed, the information illustrated can generally be adapted to a broad range of conditions. In many instances, an appropriate TTC plan is achieved by combining features from various typical applications. For example, work at an intersection might present a near-side work zone for one street and a far-side work zone for the other street. These treatments are found in two different typical applications, while a third typical application shows how to handle pedestrian crosswalk closures. For convenience in using the typical application diagrams, Tables 6C-1 and 6C-4 are reproduced in this Chapter as Tables 6H-3 and 6H-4, respectively.

02 Procedures for establishing TTC zones vary with such conditions as road configuration, location of the work, work activity, duration of work, road user volumes, road vehicle mix (buses, trucks, cars, motorcycles, and bicycles), and road user speeds.

03 In general, the procedures illustrated represent minimum solutions for the situations depicted. Except for the notes (which are clearly classified using headings as being Standard, Guidance, Option, or Support), the information presented in the typical applications can generally be regarded as Guidance.

#### Option:

04 Other devices may be added to supplement the devices and device spacing may be adjusted to provide additional reaction time or delineation. Fewer devices may be used based on field conditions.

#### Support:

05 Figures and tables found throughout Part 6 provide information for the development of TTC plans. Also, Table 6H-3 is used for the determination of sign spacing and other dimensions for various area and roadway types.

06 Table 6H-1 is an index of the 46 typical applications. Typical applications are shown on the right-hand page with notes on the facing page to the left. The legend for the symbols used in the typical applications is provided in Table 6H-2. In many of the typical applications, sign spacings and other dimensions are indicated by letters using the criteria provided in Table 6H-3. The formulas for determining taper lengths are provided in Table 6H-4.

07 Most of the typical applications show TTC devices for only one direction.

#### Guidance:

08 *The spacing of channelizing devices should not exceed the maximum distances shown in Table 6F-101(CA).*

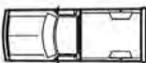
**Table 6H-1. Index to Typical Applications**

Typical Application Description	Typical Application Number
<b>Work Outside of the Shoulder (see Section 6G.06)</b>	
Work Beyond the Shoulder	TA-1
Blasting Zone	TA-2
<b>Work on the Shoulder (see Sections 6G.07 and 6G.08)</b>	
Work on the Shoulders	TA-3
Short Duration or Mobile Operation on a Shoulder	TA-4
Shoulder Closure on a Freeway	TA-5
Shoulder Work with Minor Encroachment	TA-6
<b>Work Within the Traveled Way of a Two-Lane Highway (see Section 6G.10)</b>	
Road Closed with a Diversion	TA-7
Roads Closed with an Off-Site Detour	TA-8
Overlapping Routes with a Detour	TA-9
Lane Closure on a Two-Lane Road Using Flaggers	TA-10
Lane Closure on a Two-Lane Road with Low Traffic Volumes	TA-11
Lane Closure on a Two-Lane Road Using Traffic Control Signals	TA-12
Temporary Road Closure	TA-13
Haul Road Crossing	TA-14
Work in the Center of a Road with Low Traffic Volumes	TA-15
Surveying Along the Center Line of a Road with Low Traffic Volumes	TA-16
Mobile Operations on a Two-Lane Road	TA-17
<b>Work Within the Traveled Way of an Urban Street (see Section 6G.11)</b>	
Lane Closure on a Minor Street	TA-18
Detour for One Travel Direction	TA-19
Detour for a Closed Street	TA-20
<b>Work Within the Traveled Way at an Intersection and on Sidewalks (see Section 6G.13)</b>	
Lane Closure on the Near Side of an Intersection	TA-21
Right-Hand Lane Closure on the Far Side of an Intersection	TA-22
Left-Hand Lane Closure on the Far Side of an Intersection	TA-23
Half Road Closure on the Far Side of an Intersection	TA-24
Multiple Lane Closures at an Intersection	TA-25
Closure in the Center of an Intersection	TA-26
Closure at the Side of an Intersection	TA-27
Sidewalk Detour or Diversion	TA-28
Crosswalk Closures and Pedestrian Detours	TA-29
<b>Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway (see Section 6G.12)</b>	
Interior Lane Closure on a Multi-Lane Street	TA-30
Lane Closure on a Street with Uneven Directional Volumes	TA-31
Half Road Closure on a Multi-Lane, High-Speed Highway	TA-32
Stationary Lane Closure on a Divided Highway	TA-33
Lane Closure with a Temporary Traffic Barrier	TA-34
Mobile Operation on a Multi-Lane Road	TA-35
<b>Work Within the Traveled Way of a Freeway or Expressway (see Section 6G.14)</b>	
Lane Shift on a Freeway	TA-36
Double Lane Closure on a Freeway	TA-37
Interior Lane Closure on a Freeway	TA-38
Median Crossover on a Freeway	TA-39
Median Crossover for an Entrance Ramp	TA-40
Median Crossover for an Exit Ramp	TA-41
Work in the Vicinity of an Exit Ramp	TA-42
Partial Exit Ramp Closure	TA-43
Work in the Vicinity of an Entrance Ramp	TA-44
Temporary Reversible Lane Using Movable Barriers	TA-45
<b>Work in the Vicinity of a Grade Crossing (see Section 6G.18)</b>	
Work in the Vicinity of a Grade Crossing	TA-46

**Table 6H-1(CA). Index to Typical Applications**

Typical Application Description	Typical Application Number
Work affecting Pedestrian and Bicycle Facilities (see Section 6G.05)	
Shoulder Closure on Urban (Low Speed) Locations to Accommodate Bicyclists	TA-101(CA)
Lane Closure on Freeway, Expressway, Rural and Urban (High Speed) Locations to Accommodate Bicyclists	TA-102(CA)
Detour for Bike Lane on Roads with Closure of One Travel Direction	TA-103(CA)
Right Lane and Bike Lane Closure on Far Side of Intersection	TA-104(CA)
Work Within the Traveled Way of a Two-Lane Highway (see Section 6G.10)	
Lane Shift on Road with Low Traffic Volumes	TA-105(CA)

**Table 6H-2. Meaning of Symbols on Typical Application Diagrams**

	Arrow board		Shadow vehicle
	Arrow board support or trailer (shown facing down)		Sign (shown facing left)
	Changeable message sign or support trailer		Surveyor
	Channelizing device		Temporary barrier
	Crash cushion		Temporary barrier with warning light
	Direction of temporary traffic detour		Traffic or pedestrian signal
	Direction of traffic		Truck-mounted attenuator
	Flagger		Type 3 barricade
	High-level warning device (Flag tree)		Warning light
	Longitudinal channelizing device		Work space
	Luminaire		Work vehicle
	Pavement markings that should be removed for a long-term project		

**Table 6H-3. Meaning of Letter Codes on Typical Application Diagrams**

Road Type	Distance Between Signs**		
	A	B	C
Urban (low speed)* - 25 mph or less	100 feet	100 feet	100 feet
Urban (low speed)* - more than 25 mph to 40 mph	250 feet	250 feet	250 feet
Urban (high speed)* - more than 40 mph	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2,640 feet

\* ~~Speed category to be determined by highway agency.~~

\*\* The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

**Table 6H-4. Formulas for Determining Taper Length**

Speed (S)	Taper Length (L) in feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in feet  
 W = width of offset in feet  
 S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph

**Table 6H-4(CA). Taper Length Criteria for Temporary Traffic Control Zones  
 (for 12 feet Offset Width)**

Speed* S (mph)	Minimum Taper Length** for Width of Offset 12 feet (W)			
	Merging L (feet)	Shifting L/2 (feet)	Shoulder L/3 (feet)	Down Stream (feet)***
20	80	40	27	50
25	125	63	42	50
30	180	90	60	50
35	245	123	82	50
40	320	160	107	50
45	540	270	180	50
50	600	300	200	50
55	660	330	220	50
60	720	360	240	50
65	780	390	260	50
70	840	420	280	50

\* - Posted speed limit, off-peak 85<sup>th</sup>-percentile speed prior to work starting, or the anticipated operating speed in mph.

\*\* - For other offsets use the following merging taper length formula for L:

For speeds of 40 mph or less,  $L=WS^2/60$

For speeds of 45 mph or more,  $L=WS$

Where: L = taper length in feet  
 W = width of offset in feet  
 S = posted speed limit, off-peak 85<sup>th</sup>-percentile speed prior to work starting, or the anticipated operating speed in mph

\*\*\* - Maximum downstream taper length is 100 feet. See Section 6C.08.

### Notes for Figure 6H-1 —Typical Application 1 Work Beyond the Shoulder

*Guidance:*

1. *If the work space is in the median of a divided highway, an advance warning sign should also be placed on the left side of the directional roadway.*

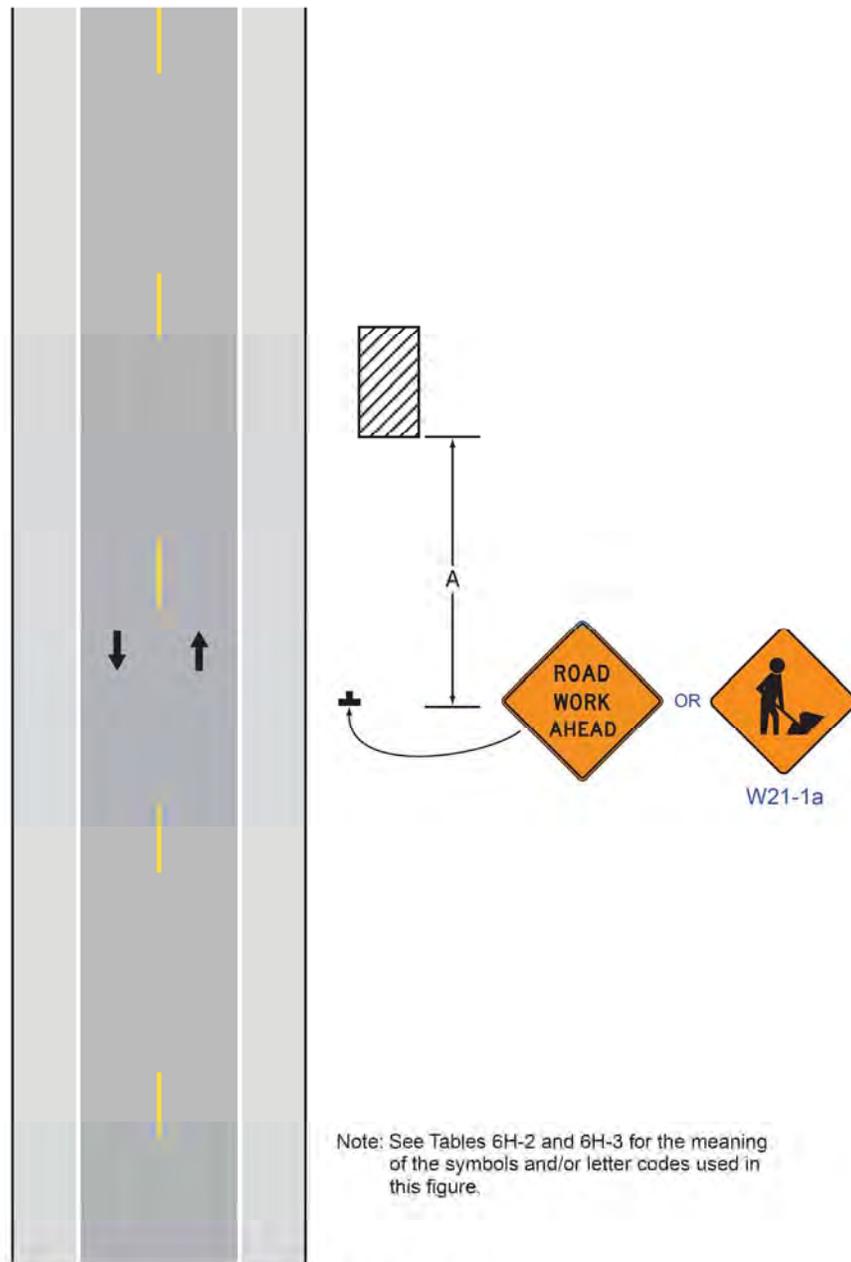
*Option:*

2. The ROAD WORK AHEAD sign or Workers (W21-1a) sign may be replaced with other appropriate signs such as the SHOULDER WORK sign. The SHOULDER WORK sign may be used for work adjacent to the shoulder.
3. The ROAD WORK AHEAD sign or Workers (W21-1a) sign may be omitted where the work space is behind a barrier, more than 24 inches behind the curb, or 15 feet or more from the edge of any roadway.
4. For short-term, short duration or mobile operation, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

**Standard:**

- 6. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

**Figure 6H-1. Work Beyond the Shoulder (TA-1)**



**Typical Application 1**

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

## Notes for Figure 6H-2—Typical Application 2 Blasting Zone

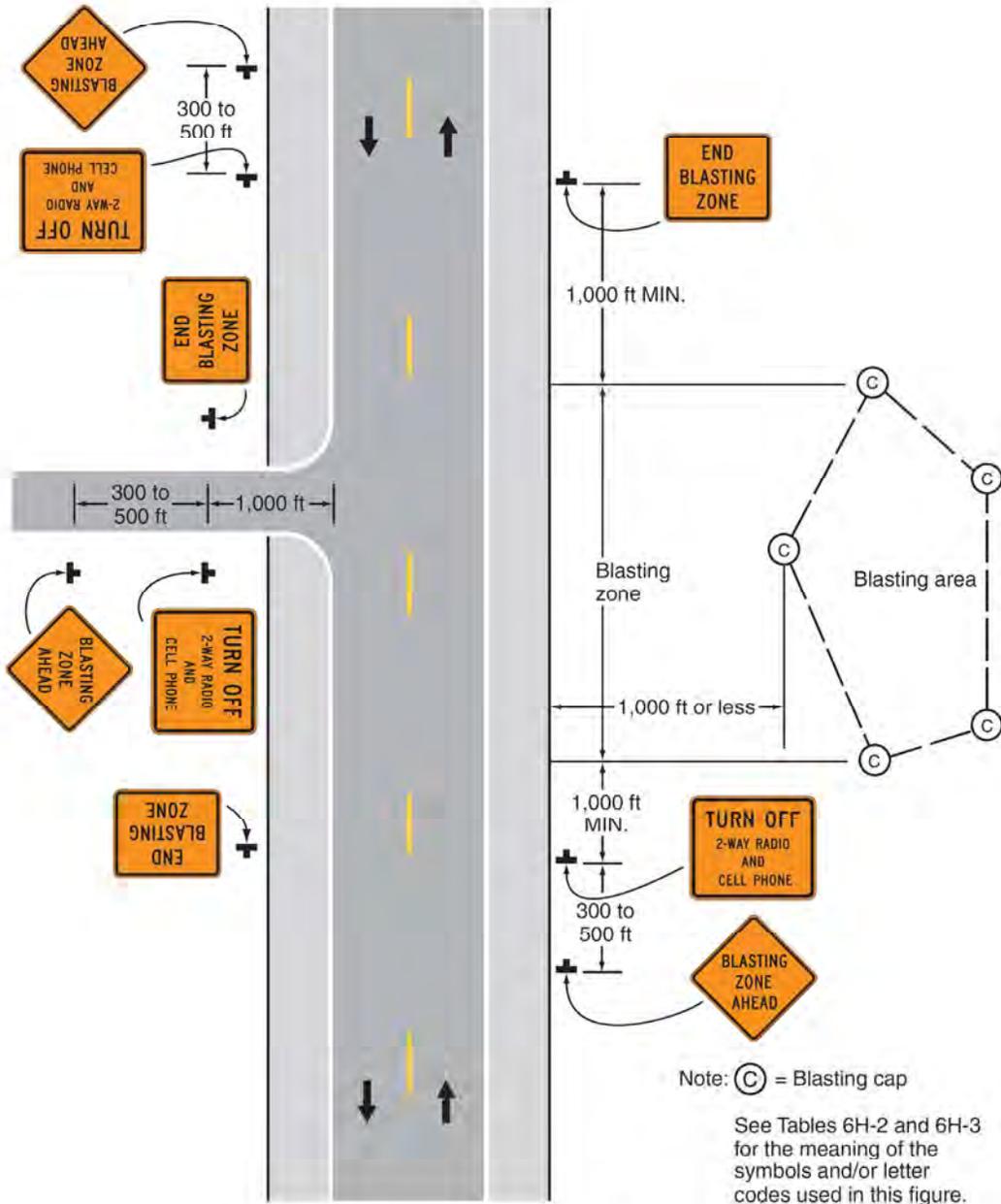
### Standard:

1. Whenever blasting caps are used within 1,000 feet of a roadway, the signing shown shall be used.
2. The signs shall be covered or removed when there are no explosives in the area or the area is otherwise secure.
3. Whenever a side road intersects the roadway between the **BLASTING ZONE AHEAD** sign and the **END BLASTING ZONE** sign, or a side road is within 1,000 feet of any blasting cap, similar signing, as on the mainline, shall be installed on the side road.
4. Prior to blasting, the blaster in charge shall determine whether road users in the blasting zone will be endangered by the blasting operation. If there is danger, road users shall not be permitted to pass through the blasting zone during blasting operations.

### Guidance:

5. *On a divided highway, the signs should be mounted on both sides of the directional roadways.*

Figure 6H-2. Blasting Zone (TA-2)



Typical Application 2

### Notes for Figure 6H-3—Typical Application 3 Work on the Shoulders

*Guidance:*

1. A *SHOULDER WORK* sign should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.

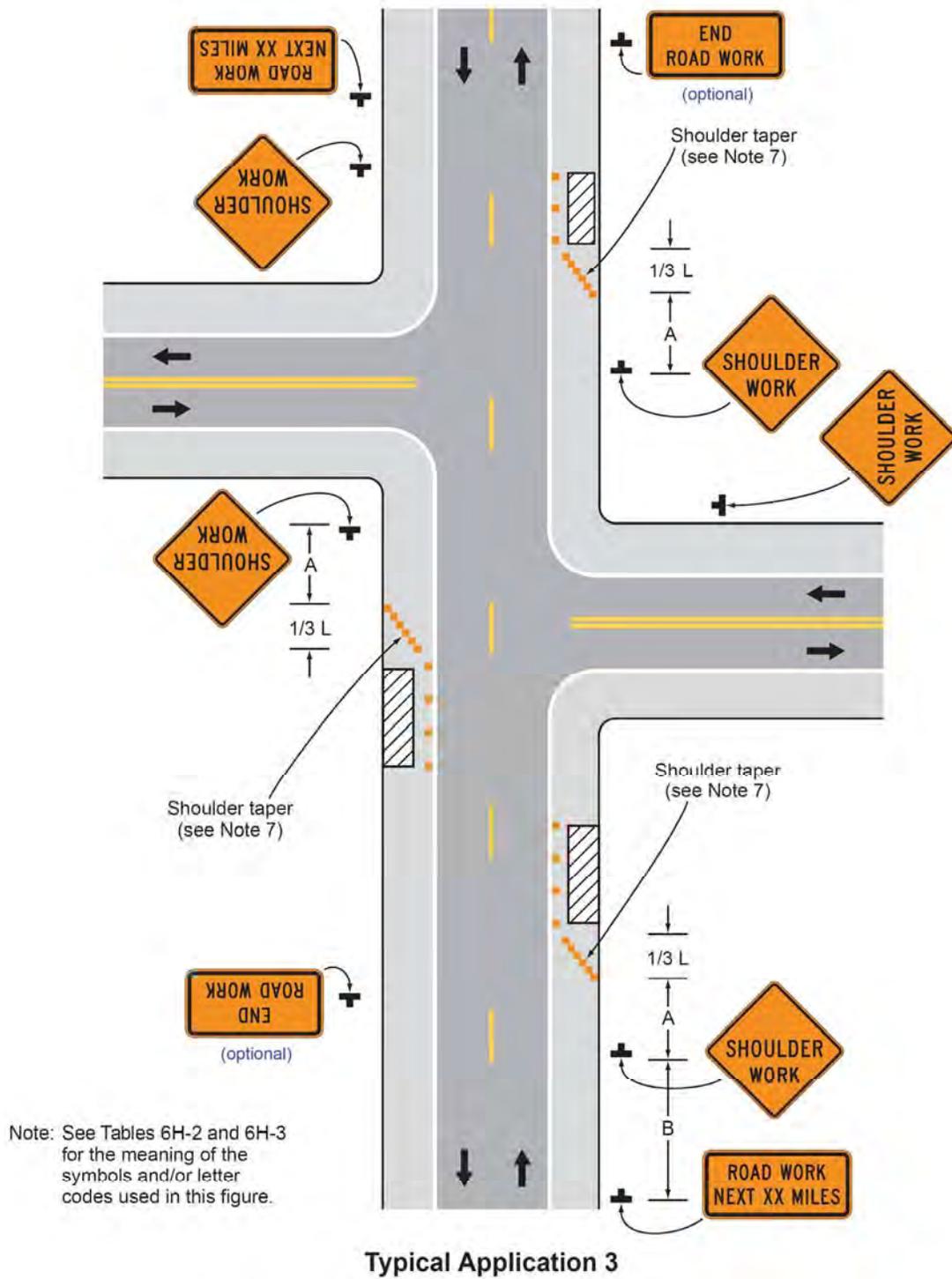
*Option:*

2. The Workers symbol signs may be used instead of SHOULDER WORK signs.
3. The SHOULDER WORK AHEAD sign on an intersecting roadway may be omitted where drivers emerging from that roadway will encounter another advance warning sign prior to this activity area.
4. For short duration operations of 60 minutes or less, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

**Standard:**

6. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
7. **When paved shoulders having a width of 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.**

**Figure 6H-3. Work on the Shoulders (TA-3)**



### Notes for Figure ~~6H-4~~ 6H-4(CA) —Typical Application 4 Short Duration or Mobile Operation on a Shoulder

*Guidance:*

1. In those situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 5 miles.
2. In those situations where the distance between the advance signs and the work is 2 miles to 5 miles, a Supplemental Distance plaque should be used with the ~~ROAD WORK AHEAD~~ SHOULDER WORK (W21-5) sign.

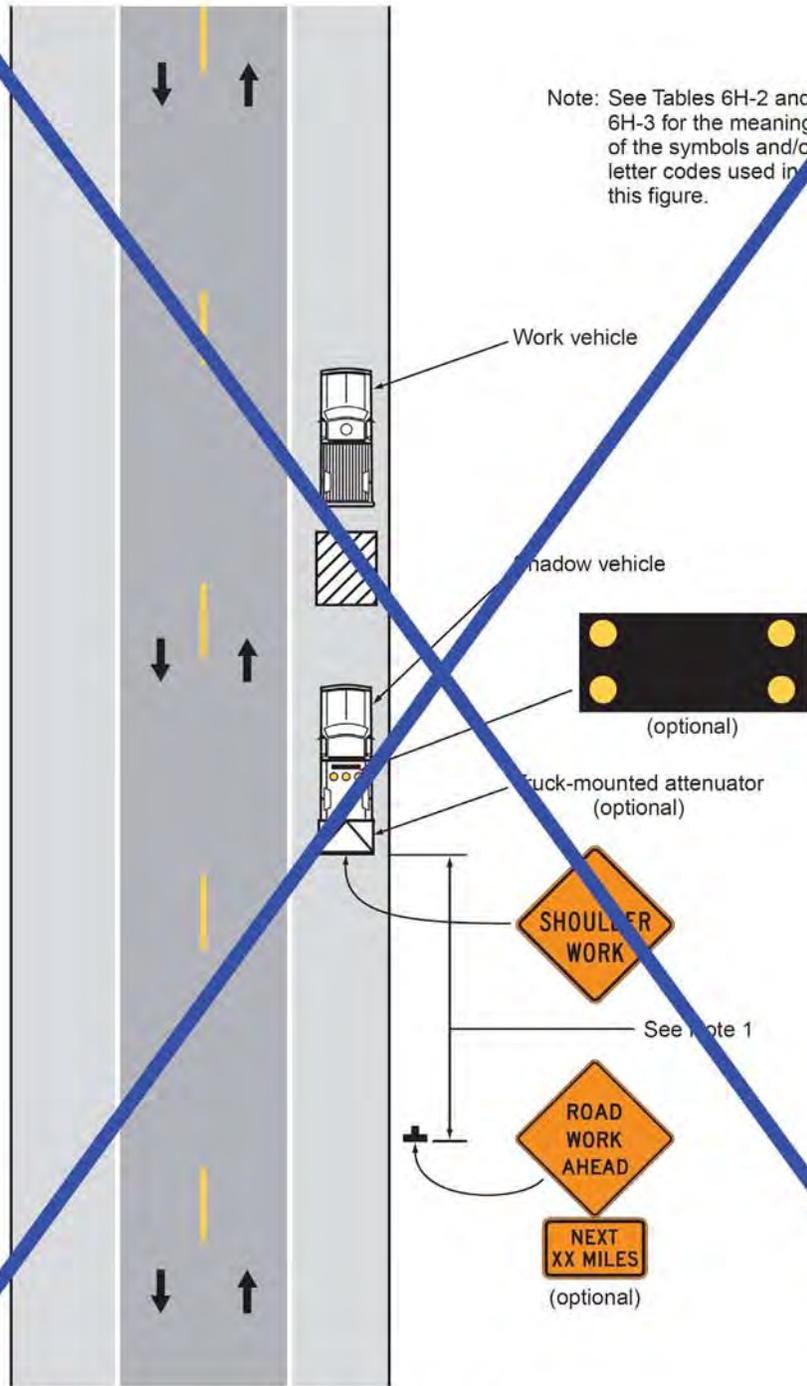
*Option:*

3. The ~~ROAD WORK NEXT XX MILES~~ sign may be used instead of the ~~ROAD WORK AHEAD~~ sign. Next Distance (W7-3a) plaque may be used with the SHOULDER WORK (W21-5) sign if the work locations occur over a distance of more than 2 miles.
4. Stationary warning signs may be omitted for short duration or mobile operations if the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

**Standard:**

6. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.
7. If an arrow board is used for an operation on the shoulder, the caution mode shall be used.
8. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.

**Figure 6H-4. Short-Duration or Mobile Operation on a Shoulder (TA-4)**



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Work vehicle

Shadow vehicle

Truck-mounted attenuator (optional)

SHOULDER WORK

See note 1

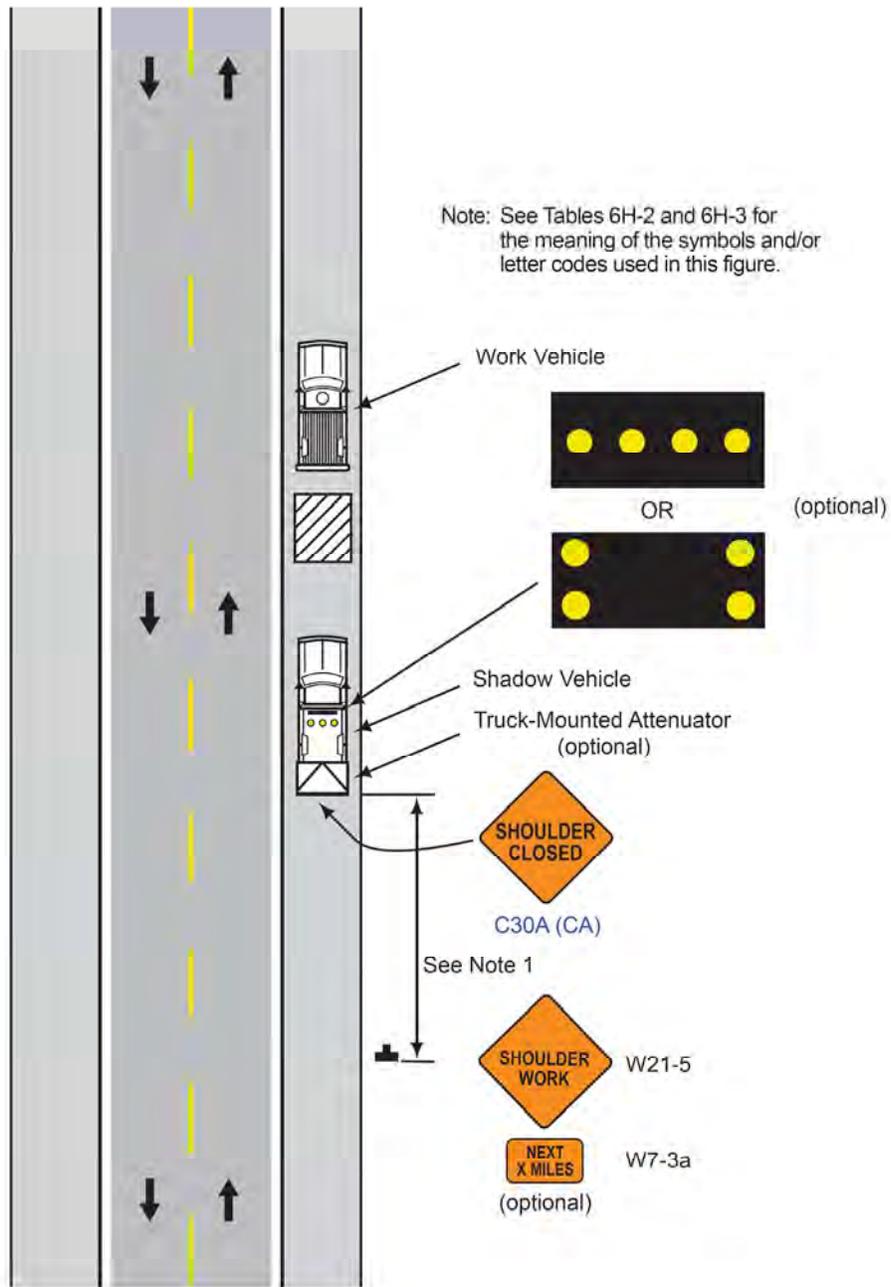
ROAD WORK AHEAD

NEXT XX MILES

(optional)

**Typical Application 4**

**Figure 6H-4 (CA). Short-Duration or Mobile Operation on Shoulder (TA-4)**



Typical Application 4

### Notes for Figure ~~6H-5~~ 6H-5(CA) — Typical Application 5 Shoulder Closure on a Freeway

*Guidance:*

1. *SHOULDER CLOSED* signs should be used on limited-access highways where there is no opportunity for disabled vehicles to pull off the roadway.
2. If drivers cannot see a pull-off area beyond the closed shoulder, information regarding the length of the shoulder closure should be provided in feet or miles, as appropriate.
3. The use of a temporary traffic barrier should be based on engineering judgment.

**Standard:**

4. Temporary traffic barriers, if used, shall comply with the provisions of Section 6F.85.

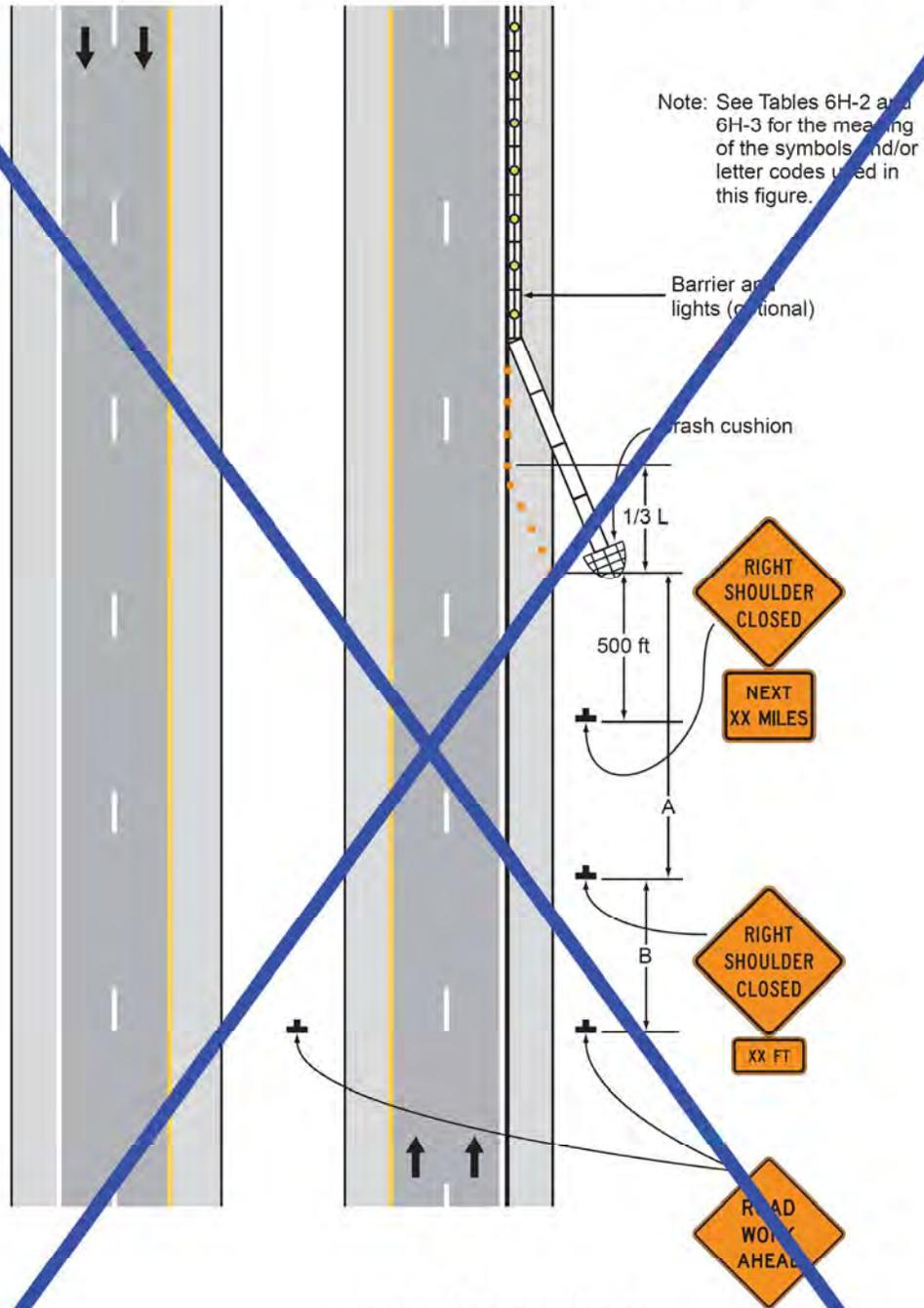
**Option:**

5. The barrier shown in this typical application is an example of one method that may be used to close a shoulder of a long-term project.
6. The warning lights shown on the barrier may be used.

**Standard:**

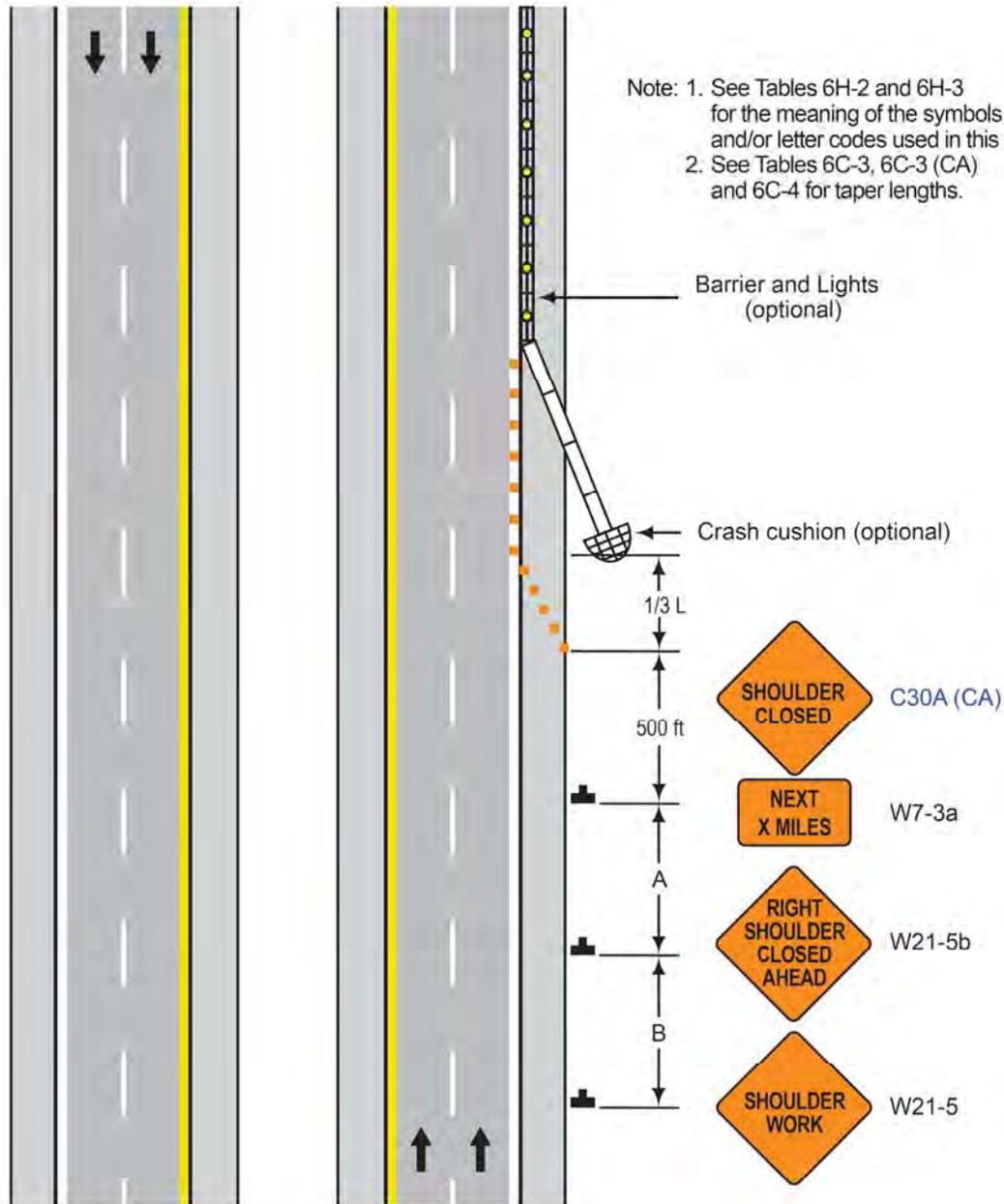
7. The minimum offset from the upstream end of the barrier to the edge of the traveled way shall be at least 15 feet unless shielded by a crash cushion.
8. Temporary traffic barriers, including their end treatments, shall be crashworthy. In order to mitigate the effect of striking the upstream end of a temporary traffic barrier, the end shall be installed in accordance with AASHTO's "Roadside Design Guide" (see Section 1A.11) by flaring until the end is outside the acceptable clear zone or by providing crashworthy end treatments. See Section 6F.85 for more details.

Figure 6H-5. Shoulder Closure on a Freeway (TA-5)



Typical Application 5

**Figure 6H-5 (CA). Shoulder Closure on Freeway (TA-5)**



**Typical Application 5**

### Notes for Figure 6H-6—Typical Application 6 Shoulder Work with Minor Encroachment

*Guidance:*

- 1. All lanes should be a minimum of 10 feet in width as measured to the near face of the channelizing devices.*
- 2. The treatment shown should be used on a minor road having low speeds. For higher-speed traffic conditions, a lane closure should be used.*

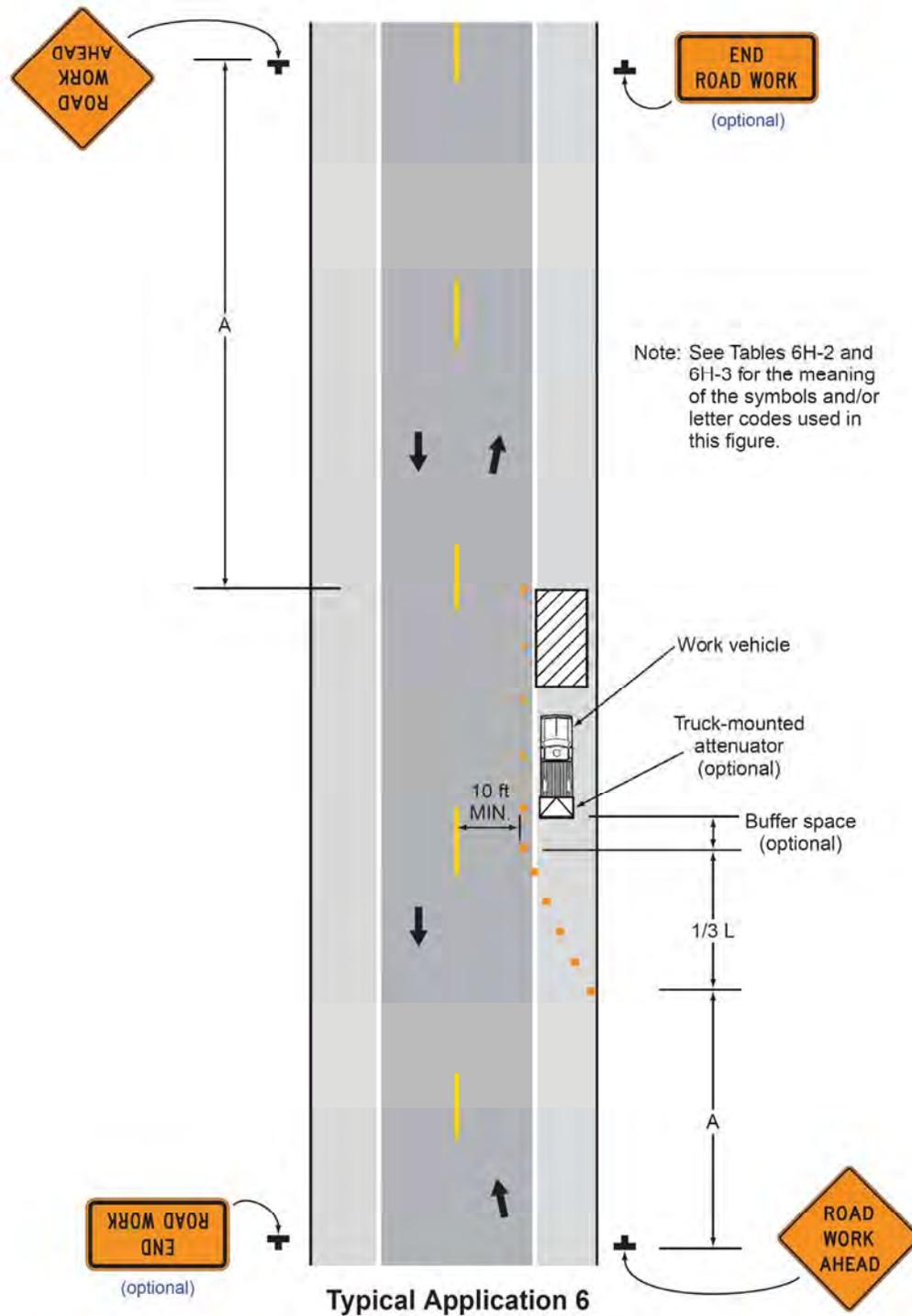
**Option:**

3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 9 feet may be used.
4. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely-spaced channelizing devices, provided that the minimum lane width of 10 feet is maintained.
5. Additional advance warning may be appropriate, such as a ROAD NARROWS sign.
6. Temporary traffic barriers may be used along the work space.
7. The shadow vehicle may be omitted if a taper and channelizing devices are used.
8. A truck-mounted attenuator may be used on the shadow vehicle.
9. For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

**Standard:**

- 11. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.**
- 12. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.**
- 13. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
- 14. Note 3 shall not be applicable for State highways. Note #1 shall be used instead for State highways.**

**Figure 6H-6. Shoulder Work with Minor Encroachment (TA-6)**



### Notes for Figure 6H-7 — Typical Application 7 Road Closure with a Diversion

Support:

1. Signs and object markers are shown for one direction of travel only.

**Standard:**

2. **Devices similar to those depicted shall be placed for the opposite direction of travel.**
3. **Pavement markings no longer applicable to the traffic pattern of the roadway shall be removed or obliterated before any new traffic patterns are open to traffic.**
4. **Temporary barriers and end treatments shall be crashworthy.**

*Guidance:*

5. *If the tangent distance along the temporary diversion is more than 600 feet, a Reverse Curve sign, left first, should be used instead of the Double Reverse Curve sign, and a second Reverse Curve sign, right first, should be placed in advance of the second reverse curve back to the original alignment.*
6. *When the tangent section of the diversion is more than 600 feet, and the diversion has sharp curves with recommended speeds of 30 mph or less, Reverse Turn signs should be used.*
7. *Where the temporary pavement and old pavement are different colors, the temporary pavement should start on the tangent of the existing pavement and end on the tangent of the existing pavement.*

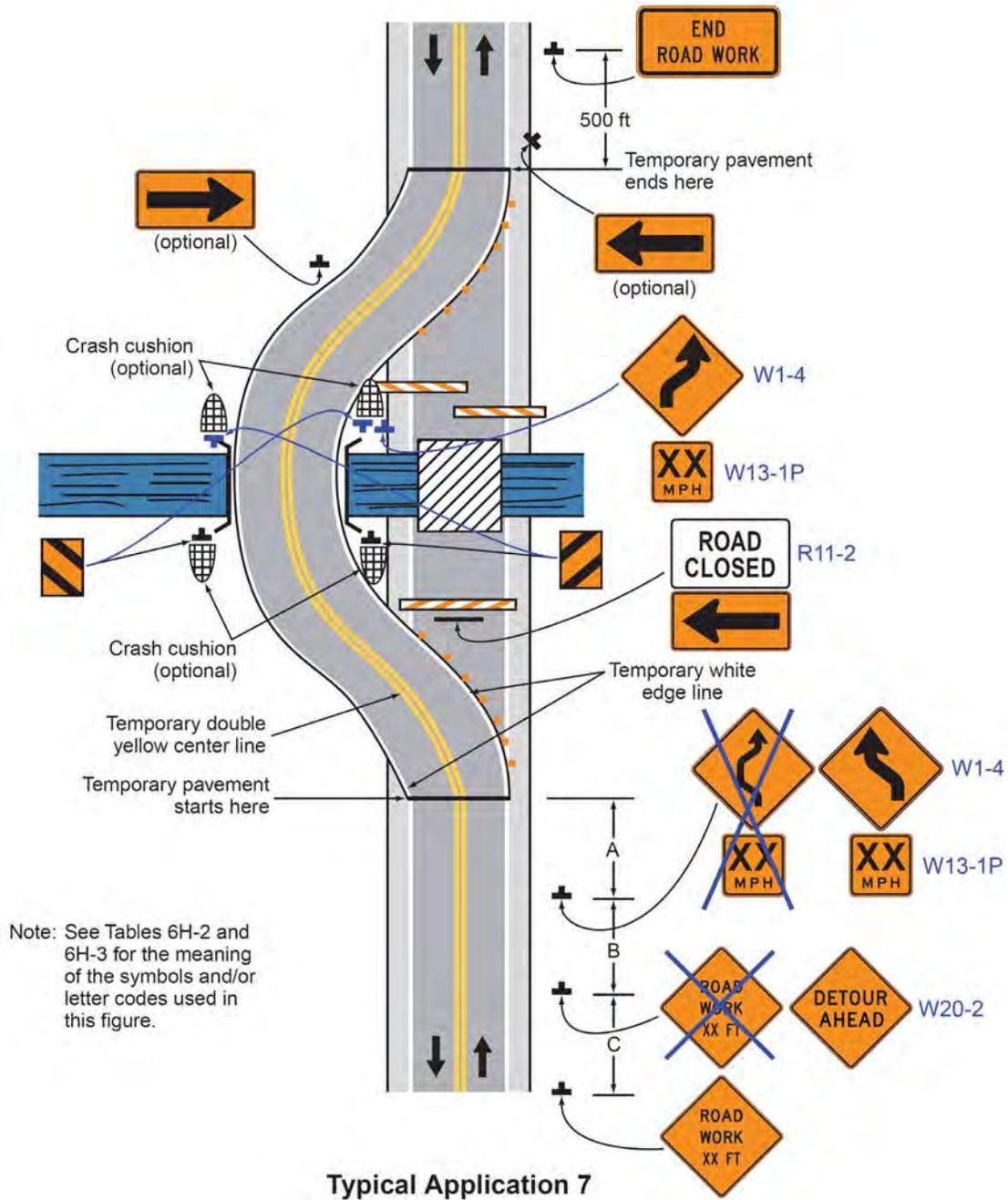
Option:

8. Flashing warning lights and/or flags may be used to call attention to the warning signs.
9. On sharp curves, large arrow signs may be used in addition to other advance warning signs.
10. Delineators or channelizing devices may be used along the diversion.
11. If the tangent distance along the temporary diversion is less than 600 feet, additional One-Direction Large Arrow (W1-6) and Chevron Alignment (W1-8) signs may be used.
12. When recommended speeds are the same for each curve, one Double Reverse Curve (W24-1) sign may be used, instead of two Reverse Curve (W1-4) signs, in advance of the first curve.

Support:

13. Use crash cushions, wherever applicable.

**Figure 6H-7. Road Closure with a Diversion (TA-7)**



### **Notes for Figure 6H-8—Typical Application 8 Road Closure with an Off-Site Detour**

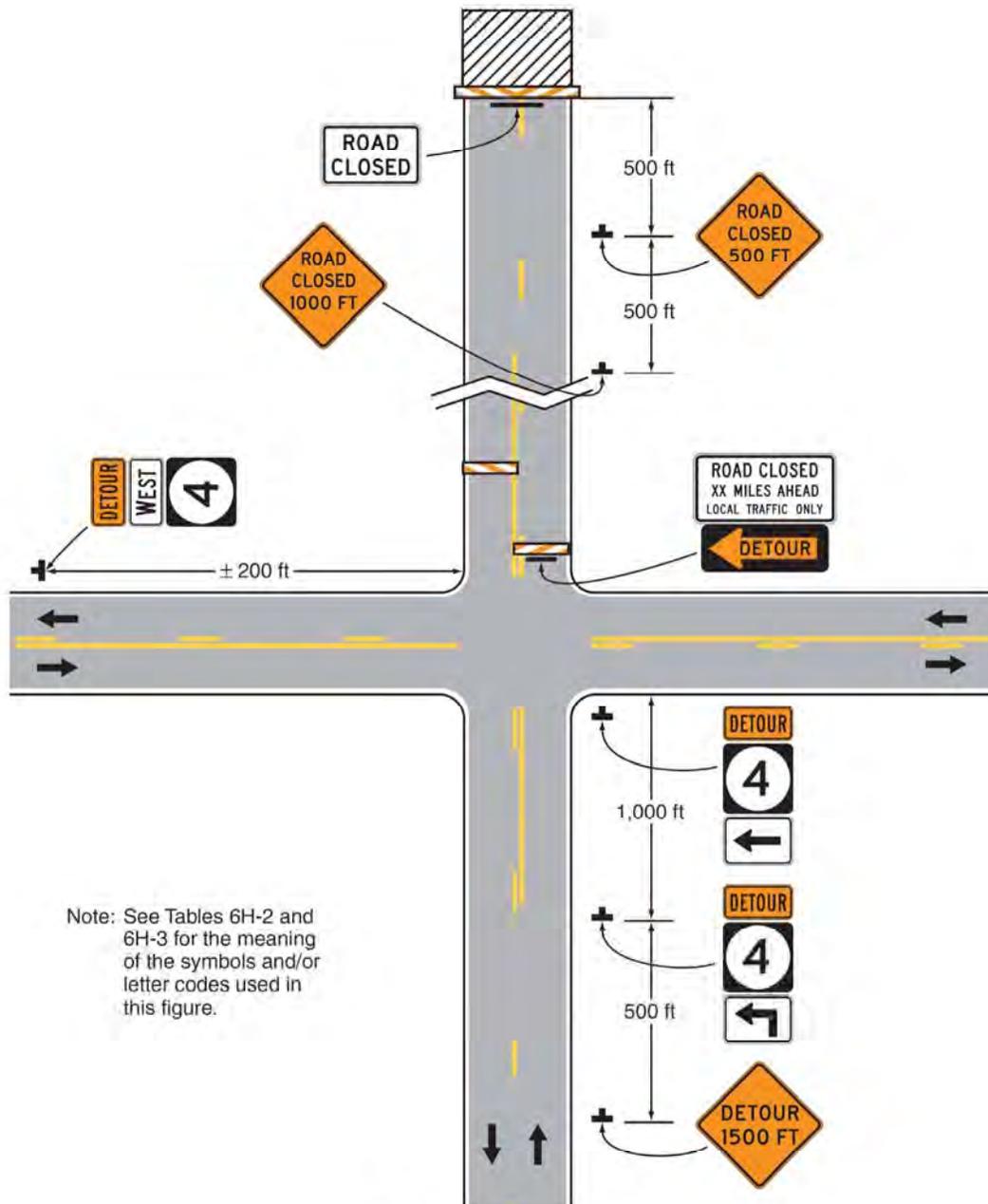
*Guidance:*

1. *Regulatory traffic control devices should be modified as needed for the duration of the detour.*

*Option:*

2. If the road is opened for some distance beyond the intersection and/or there are significant origin/ destination points beyond the intersection, the ROAD CLOSED and DETOUR signs on Type 3 Barricades may be located at the edge of the traveled way.
3. A Route Sign Directional assembly may be placed on the far left corner of the intersection to augment or replace the one shown on the near right corner.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Cardinal direction plaques may be used with route signs.

Figure 6H-8. Road Closure with an Off-Site Detour (TA-8)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 8

### **Notes for Figure 6H-9—Typical Application 9 Overlapping Routes with a Detour**

**Support:**

1. TTC devices are shown for one direction of travel only.

**Standard:**

- 2. Devices similar to those depicted shall be placed for the opposite direction of travel.**

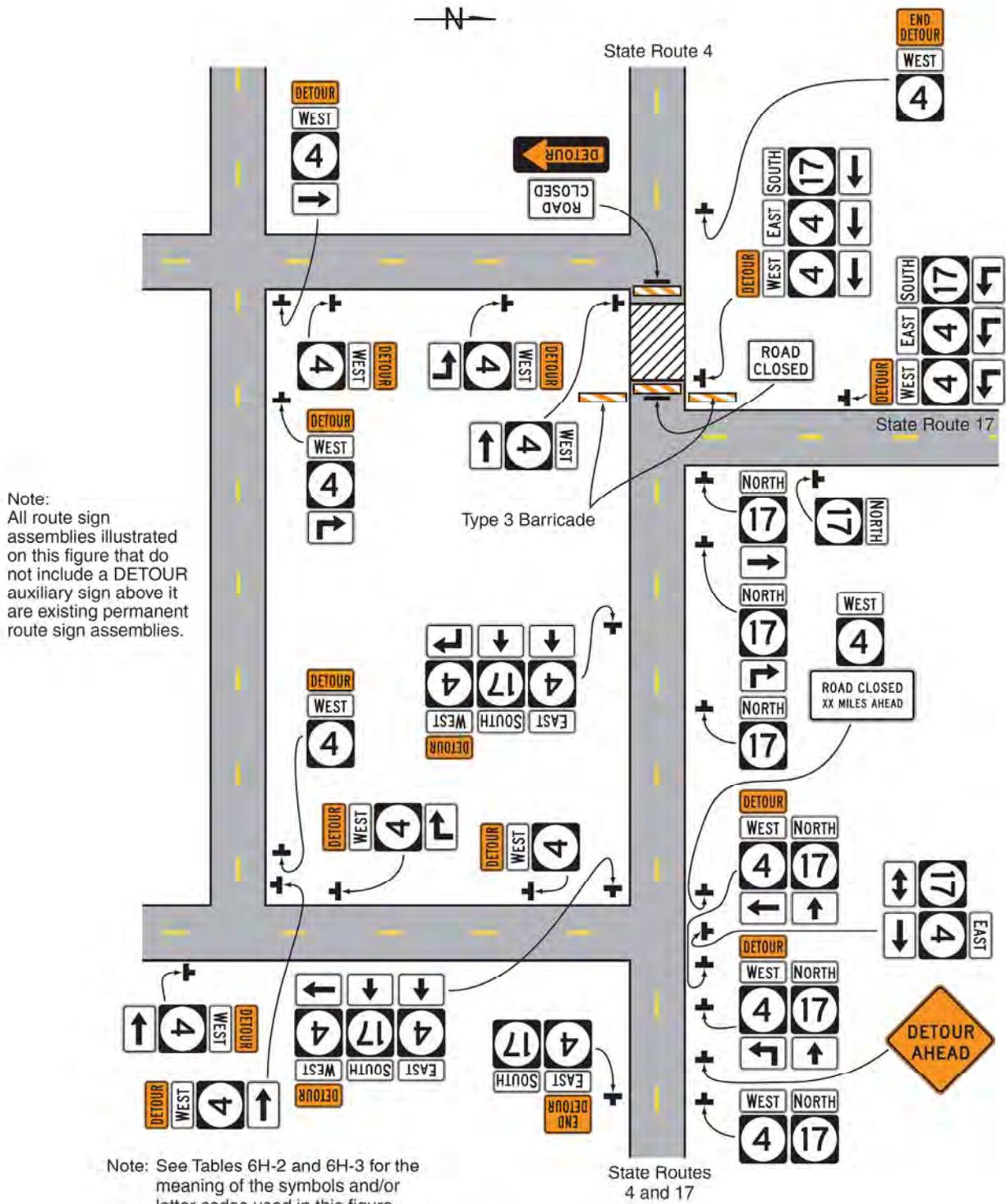
*Guidance:*

- 3. STOP or YIELD signs displayed to side roads should be installed as needed along the temporary route.*

**Option:**

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Flashing warning lights may be used on the Type 3 Barricades.
6. Cardinal direction plaques may be used with route signs.

**Figure 6H-9. Overlapping Routes with a Detour (TA-9)**



**Typical Application 9**

### Notes for Figure ~~6H-10~~ 6H-10(CA) — Typical Application 10 Lane Closure on a Two-Lane Road Using Flaggers

Option:

1. For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used (see Chapter 6E).
2. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations.
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

4. *The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.*

Standard:

5. **At night, flagger stations shall be illuminated, except in emergencies.**

Guidance:

6. *When used, the BE PREPARED TO STOP sign should be located ~~between~~ after the Flagger sign and the ONE LANE ROAD sign.*
7. *When a grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the grade crossing, the TTC zone should be extended so that the transition area precedes the grade crossing.*
8. *When a grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.*
9. *When a grade crossing exists within the activity area, drivers operating on the left-hand side of the normal center line should be provided with comparable warning devices as for drivers operating on the right-hand side of the normal center line.*
10. *Early coordination with the railroad company or light rail transit agency should occur before work starts.*

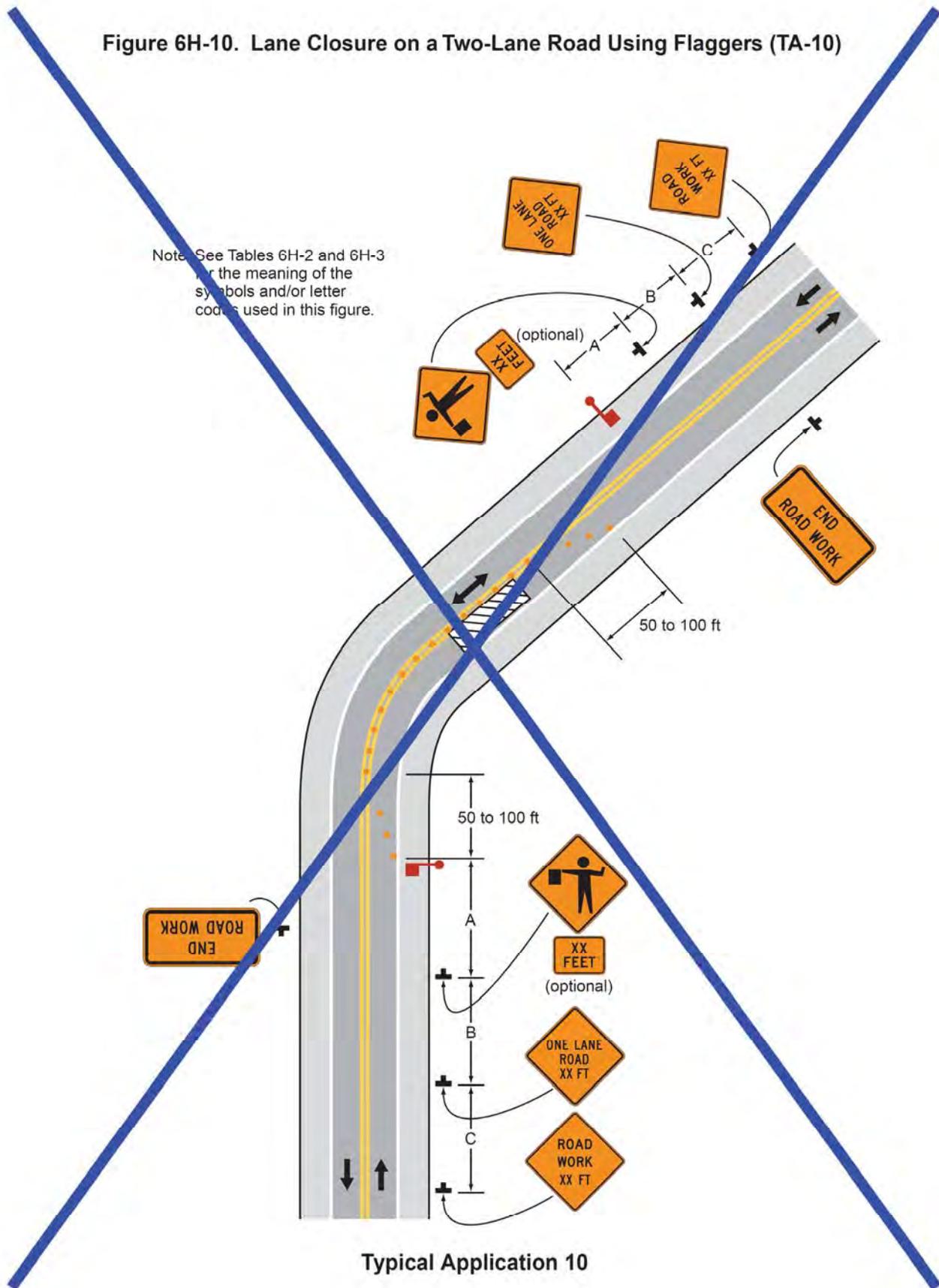
Option:

11. A flagger or a uniformed law enforcement officer may be used at the grade crossing to minimize the probability that vehicles are stopped within 15 feet of the grade crossing, measured from both sides of the outside rails.

Support:

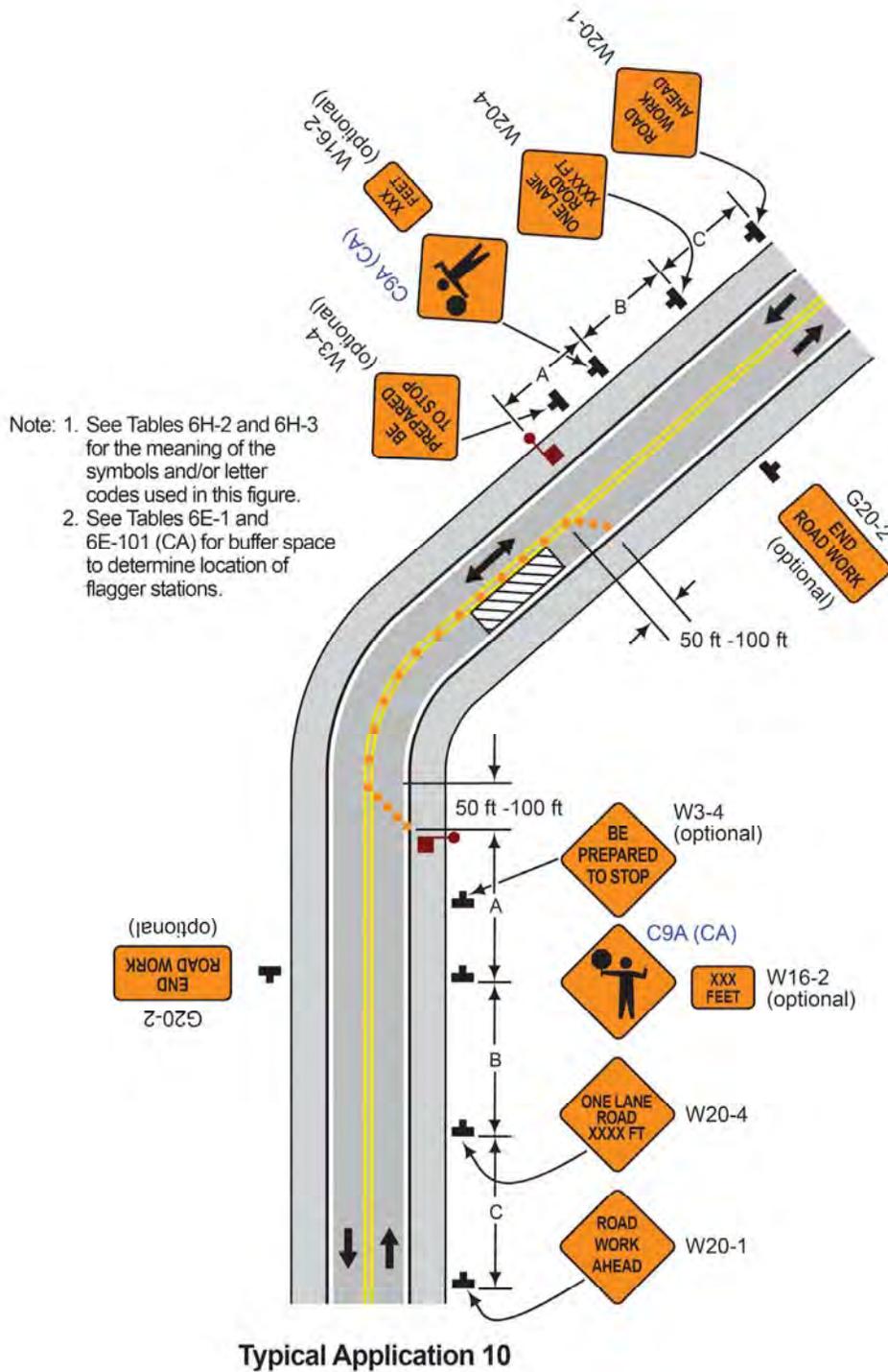
12. For State highways, see Department of Transportation's Standard Plan T13. See Section 1A.11 for information regarding this publication.

**Figure 6H-10. Lane Closure on a Two-Lane Road Using Flaggers (TA-10)**



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

**Figure 6H-10 (CA). Lane Closure on Two-Lane Road Using Flaggers (TA-10)**



### Notes for Figure 6H-11—Typical Application 11 Lane Closure on a Two-Lane Road with Low Traffic Volumes

Option:

1. This TTC zone application may be used as an alternate to the TTC application shown in Figure ~~6H-10~~ 6H-10(CA) (using flaggers) when the following conditions exist:
  - a. Vehicular traffic volume is such that sufficient gaps exist for vehicular traffic that must yield.
  - b. Road users from both directions are able to see approaching vehicular traffic through and beyond the worksite and have sufficient visibility of approaching vehicles.
2. The Type B flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs whenever a night lane closure is necessary.

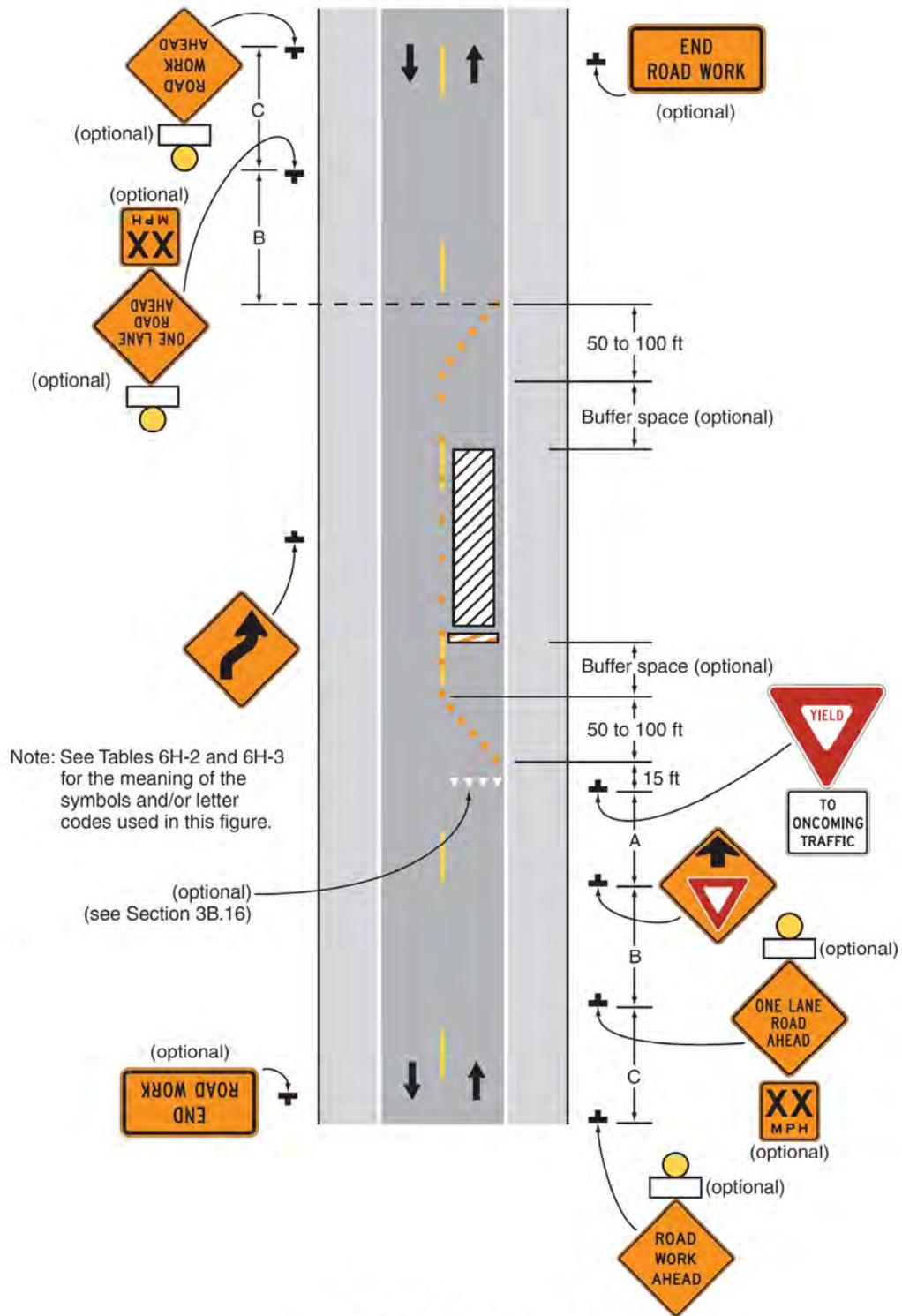
Standard:

3. The approach to the side that is not closed shall be visible (for a distance equal to the safe passing sight distance for that approach) to the driver who must yield or stop.

Support:

See Section 3B.02 and 6C.15.

**Figure 6H-11. Lane Closure on a Two-Lane Road with Low Traffic Volumes (TA-11)**



**Typical Application 11**

## **Notes for Figure 6H-12 — Typical Application 12 Lane Closure on a Two-Lane Road Using Traffic Control Signals**

**Standard:**

- 1. Temporary traffic control signals shall be installed and operated in accordance with the provisions of Part 4. Temporary traffic control signals shall meet the physical display and operational requirements of conventional traffic control signals.**
- 2. Temporary traffic control signal timing shall be established by authorized officials. Durations of red clearance intervals shall be adequate to clear the one-lane section of conflicting vehicles.**
- 3. When the temporary traffic control signal is changed to the flashing mode, either manually or automatically, red signal indications shall be flashed to both approaches.**
- 4. Stop lines shall be installed with temporary traffic control signals for intermediate and long-term closures. Existing conflicting pavement markings and raised pavement marker reflectors between the activity area and the stop line shall be removed. After the temporary traffic control signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.**
- 5. Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.**

*Guidance:*

- 6. Where no-passing lines are not already in place, they should be added.*
- 7. Adjustments in the location of the advance warning signs should be made as needed to accommodate the horizontal or vertical alignment of the roadway, recognizing that the distances shown for sign spacings are minimums. Adjustments in the height of the signal heads should be made as needed to conform to the vertical alignment.*

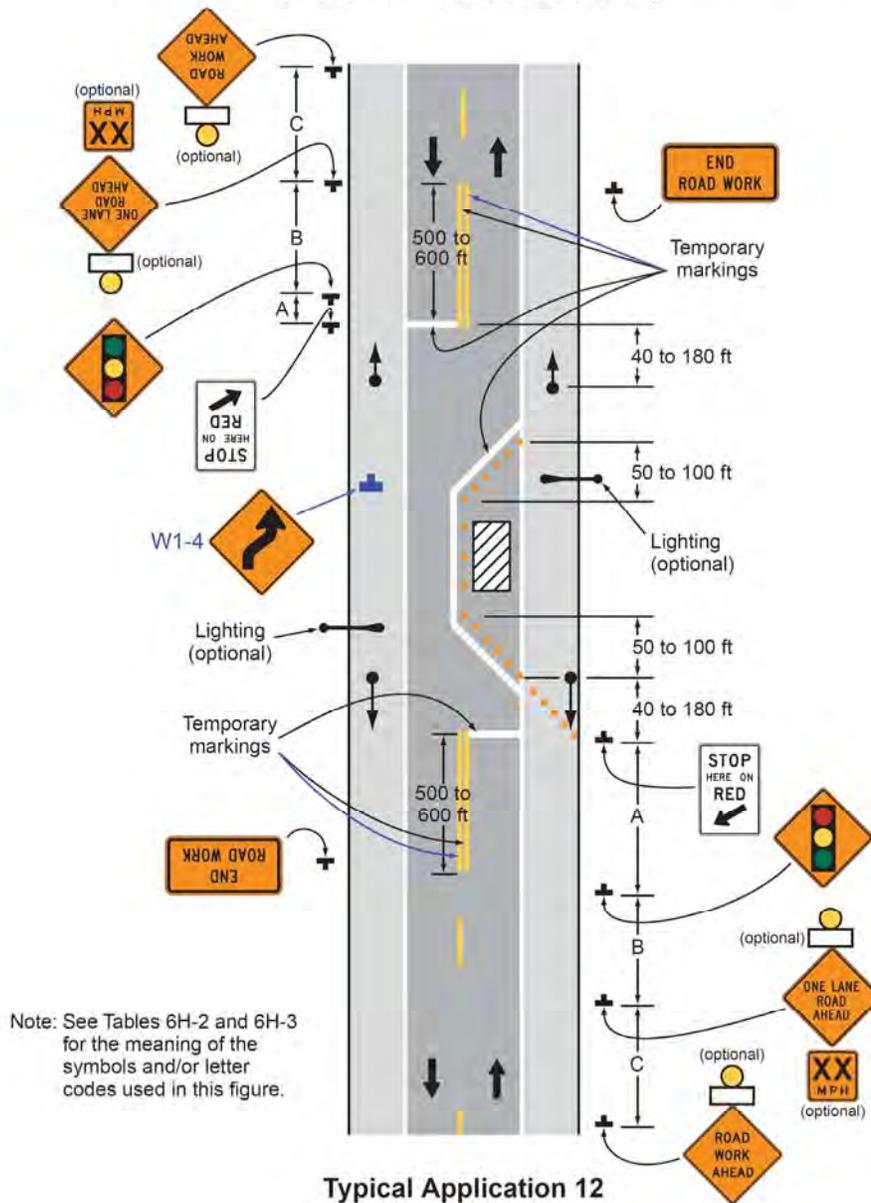
**Option:**

- 8. Flashing warning lights shown on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs may be used.**
- 9. Removable pavement markings may be used.**

**Support:**

- 10. Temporary traffic control signals are preferable to flaggers for long-term projects and other activities that would require flagging at night.**
- 11. The maximum length of activity area for one-way operation under temporary traffic control signal control is determined by the capacity required to handle the peak demand.**

**Figure 6H-12. Lane Closure on a Two-Lane Road Using Traffic Control Signals (TA-12)**



### Notes for Figure 6H-13 —Typical Application 13 Temporary Road Closure

Support:

1. Conditions represented are a planned closure not exceeding 20 minutes during the daytime.

**Standard:**

- 2. A flagger or uniformed law enforcement officer shall be used for this application. The flagger, if used for this application, shall follow the procedures provided in Sections 6E.07 and 6E.08.**

*Guidance:*

- 3. The uniformed law enforcement officer, if used for this application, should follow the procedures provided in Sections 6E.07 and 6E.08.*

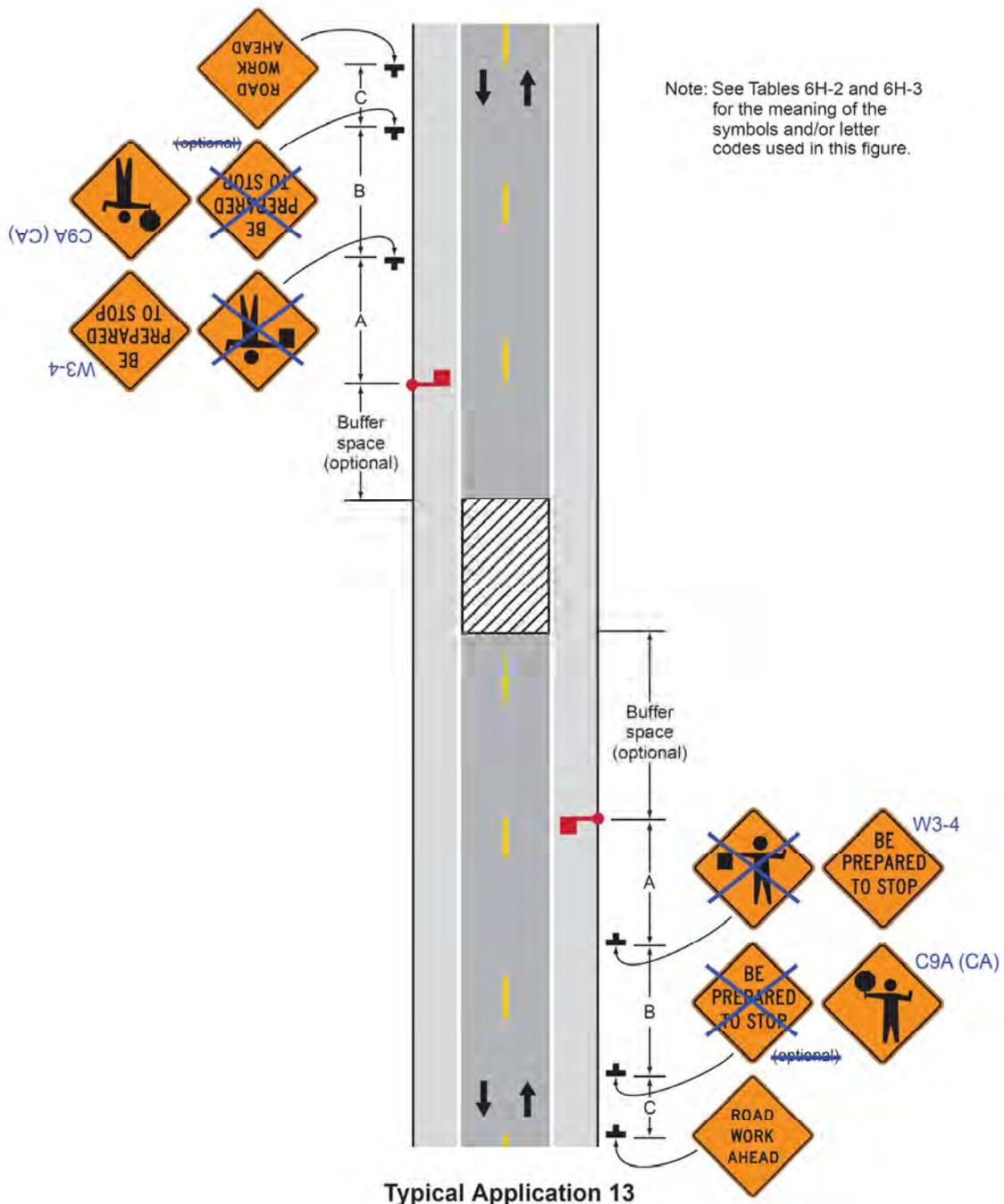
Option:

4. A BE PREPARED TO STOP sign may be added to the sign series.

*Guidance:*

- 5. When used, the BE PREPARED TO STOP sign should be located ~~before~~ after the Flagger symbol sign.*

Figure 6H-13. Temporary Road Closure (TA-13)



## Notes for Figure ~~6H-14~~ **6H-14(CA)** — Typical Application 14 Haul Road Crossing

*Guidance:*

- 1. Floodlights should be used to illuminate haul road crossings where existing light is inadequate.*
- 2. Where no-passing lines are not already in place, they should be added.*

**Standard:**

- 3. The traffic control method selected shall be used in both directions.**

**Flagging Method**

- 4. When a road used exclusively as a haul road is not in use, the haul road shall be closed with Type 3 Barricades and the Flagger symbol signs covered.**
- 5. The flagger shall follow the procedures provided in Sections 6E.07 and 6E.08.**
- 6. At night, flagger stations shall be illuminated, except in emergencies.**

**Signalized Method**

- 7. When a road used exclusively as a haul road is not in use, the haul road shall be closed with Type 3 Barricades. The signals shall either flash yellow on the main road or be covered, and the Signal Ahead and STOP HERE ON RED signs shall be covered or hidden from view.**
- 8. The temporary traffic control signals shall control both the highway and the haul road and shall meet the physical display and operational requirements of conventional traffic control signals as described in Part 4. Traffic control signal timing shall be established by authorized officials.**
- 9. Stop lines shall be used on existing highway with temporary traffic control signals.**
- 10. Existing conflicting pavements markings between the stop lines shall be removed. After the temporary traffic control signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.**

**Figure 6H-14. Haul Road Crossing (TA-14)**

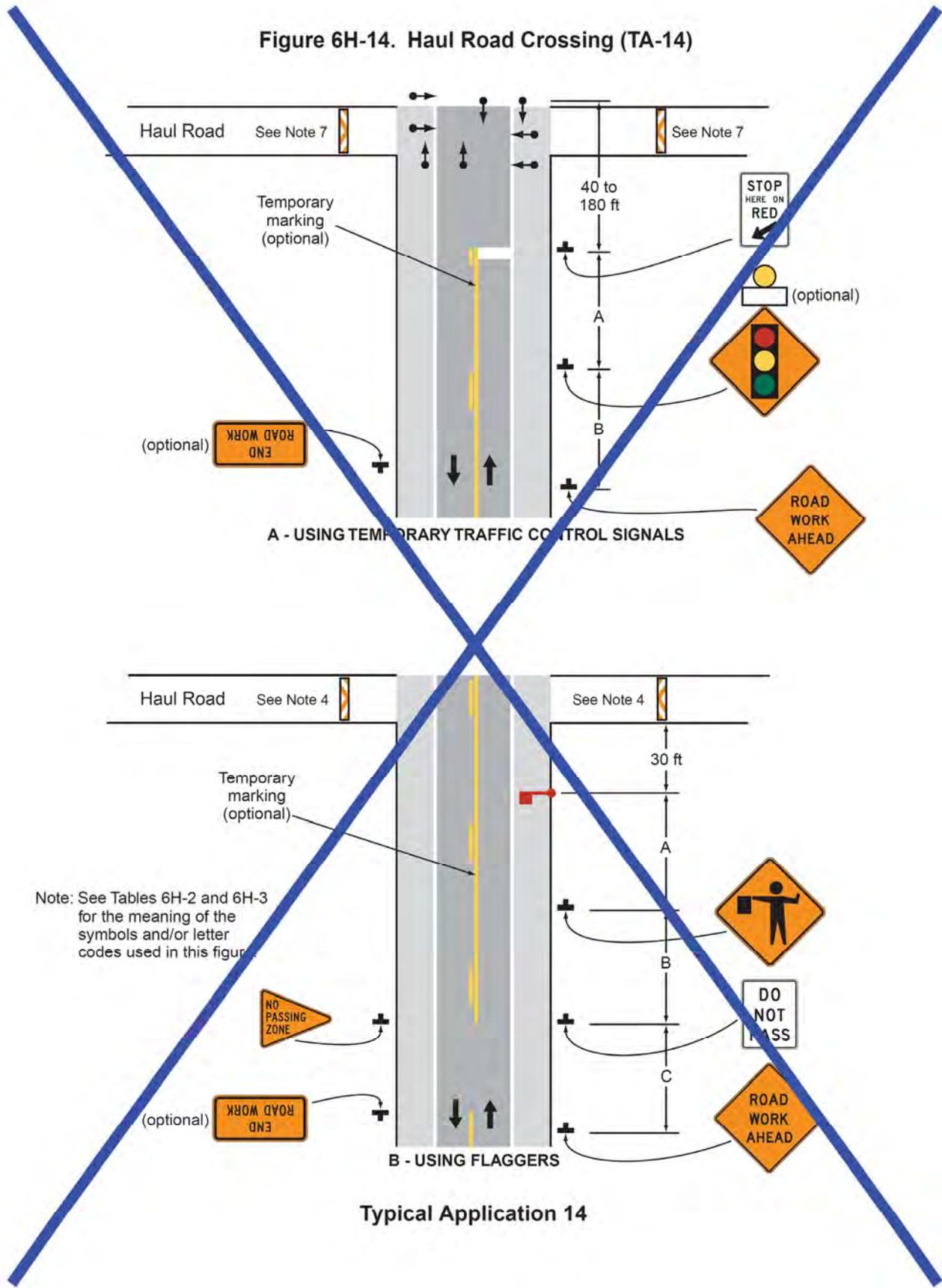
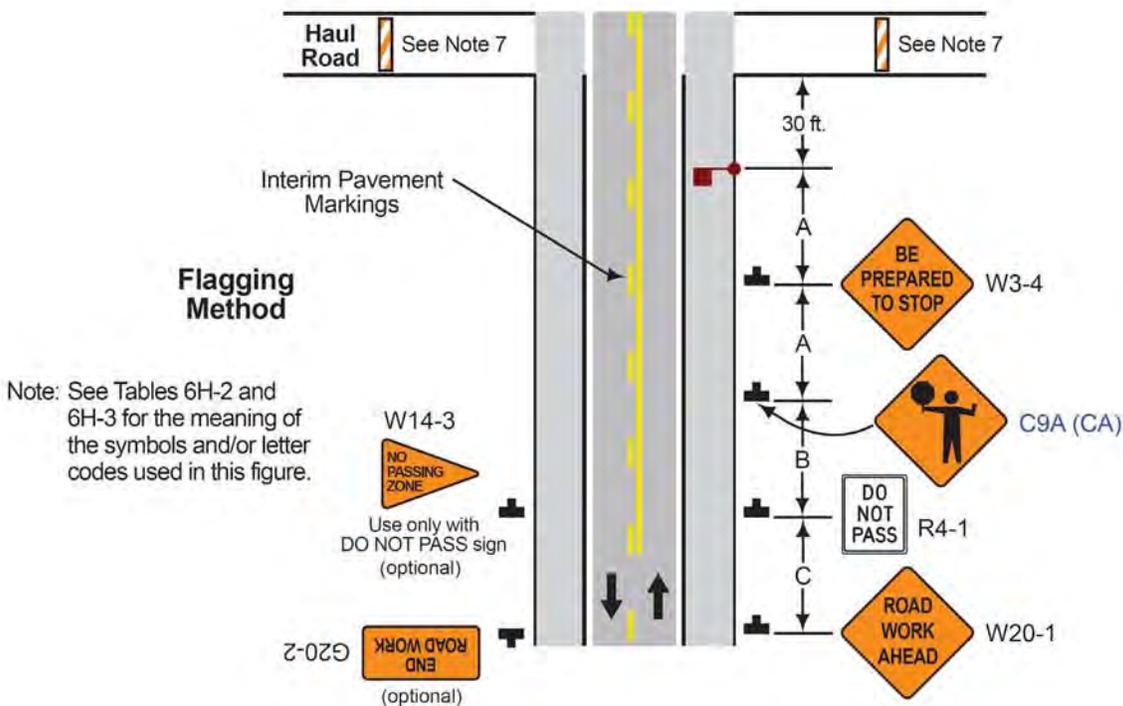
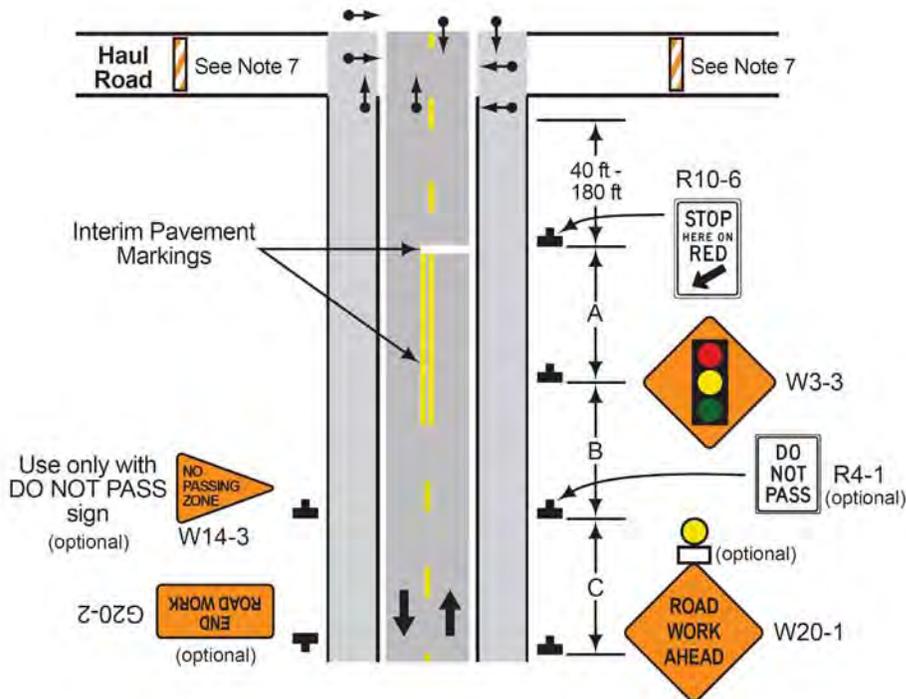


Figure 6H-14 (CA). Haul Road Crossing (TA-14)



**Flagging Method**

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 14

## Notes for Figure 6H-15—Typical Application 15 Work in the Center of a Road with Low Traffic Volumes

*Guidance:*

1. *The lanes on either side of the center work space should have a minimum width of 10 feet as measured from the near edge of the channelizing devices to the edge of the pavement or the outside edge of the paved shoulder.*

**Option:**

2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
3. If the closure continues overnight, warning lights may be used on the channelizing devices.
4. A lane width of 9 feet may be used for short-term stationary work on low-volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.
5. A work vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights may be used instead of the channelizing devices forming the tapers or the high-level warning devices.

**Standard:**

**Note 4 and 5 shall not be applicable for State highways. Note #1 shall be used instead for State highways.**

**Option:**

6. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

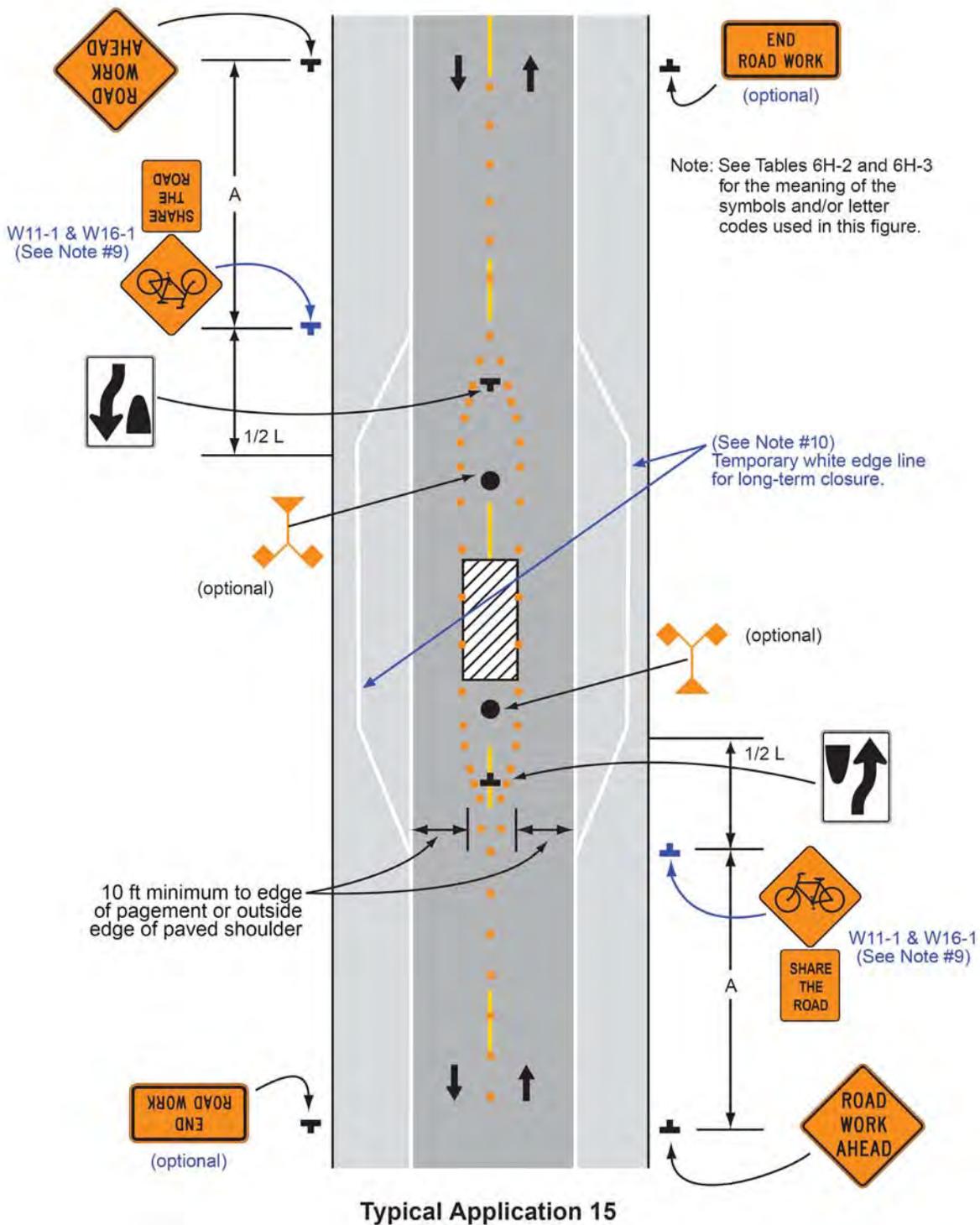
**Standard:**

**7. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

*Guidance:*

8. *All advance warning signs should be placed so that the path of travel for bicycles is not blocked while maintaining visibility for road users.*
9. *When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (see Section 6G.02) and the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, the Bicycle Crossing (W11-1) sign and the SHARE THE ROAD (W16-1P) plaque should be used to advise motorists of the presence of bicyclists in the travel way lanes.*
10. *When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (see Section 6G.02), the temporary white edge line should be used on the shoulder to indicate the use of a portion of the shoulder as a traveled way lane.*

**Figure 6H-15. Work in Center of Road with Low Traffic Volumes (TA-15)**



### Notes for Figure 6H-16—Typical Application 16 Surveying Along the Center Line of a Road with Low Traffic Volumes

*Guidance:*

1. The lanes on either side of the center work space should have a minimum width of 10 feet as measured from the near edge of the channelizing devices to the edge of the pavement or the outside edge of the paved shoulder.
2. Cones should be placed 6 to 12 inches on either side of the center line.
3. A flagger should be used to warn workers who cannot watch road users.

**Standard:**

4. For surveying on the center line of a high-volume road, one lane shall be closed using the information illustrated in Figure ~~6H-10~~ 6H-10(CA).

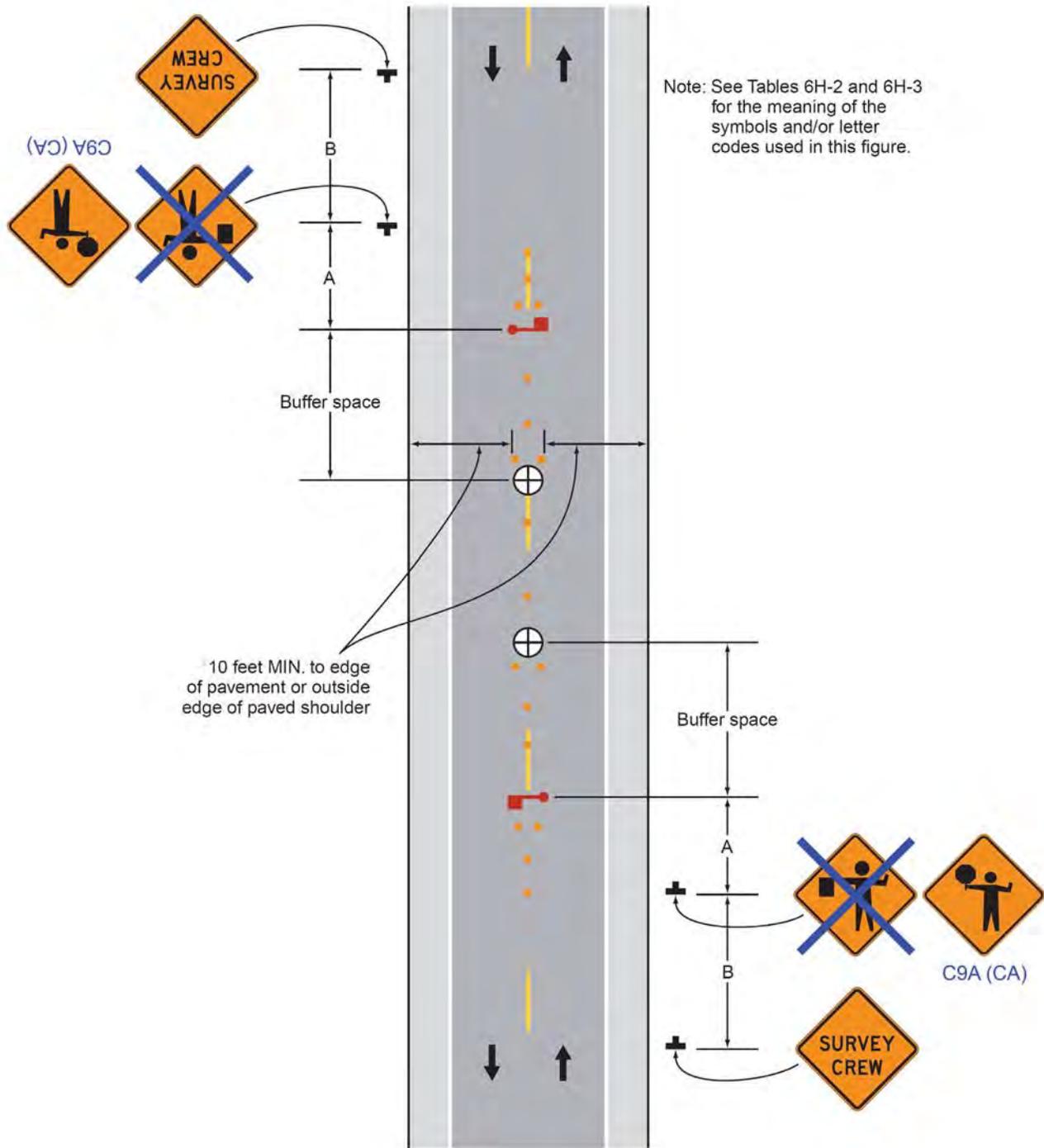
*Option:*

5. A high-level warning device may be used to protect a surveying device, such as a target on a tripod.
6. Cones may be omitted for a cross-section survey.
7. ROAD WORK AHEAD signs may be used in place of the SURVEY CREW AHEAD signs.
8. Flags may be used to call attention to the advance warning signs.
9. If the work is along the shoulder, the flagger may be omitted.
10. For a survey along the edge of the road or along the shoulder, cones may be placed along the edge line.
11. A BE PREPARED TO STOP sign may be added to the sign series.

*Guidance:*

12. When used, the BE PREPARED TO STOP sign should be located ~~before~~ after the Flagger symbol sign.

**Figure 6H-16. Surveying Along the Center Line of a Road with Low Traffic Volumes (TA-16)**



**Typical Application 16**

### Notes for Figure 6H-17—Typical Application 17 Mobile Operations on a Two-Lane Road

**Standard:**

1. **Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.**
2. **Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.**
3. **If an arrow board is used, it shall be used in the caution mode.**

*Guidance:*

4. *Where practical and when needed, the work and shadow vehicles should pull over periodically to allow vehicular traffic to pass.*
5. *Whenever adequate stopping sight distance exists to the rear, the shadow vehicle should maintain the minimum distance from the work vehicle and proceed at the same speed. The shadow vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance.*
6. *The shadow vehicles should also be equipped with two high-intensity flashing lights mounted on the rear, adjacent to the sign.*

**Option:**

7. The distance between the work and shadow vehicles may vary according to terrain, paint drying time, and other factors.
8. Additional shadow vehicles to warn and reduce the speed of oncoming or opposing vehicular traffic may be used. Law enforcement vehicles may be used for this purpose.
9. A truck-mounted attenuator may be used on the shadow vehicle or on the work vehicle.
10. If the work and shadow vehicles cannot pull over to allow vehicular traffic to pass frequently, a DO NOT PASS sign may be placed on the rear of the vehicle blocking the lane.

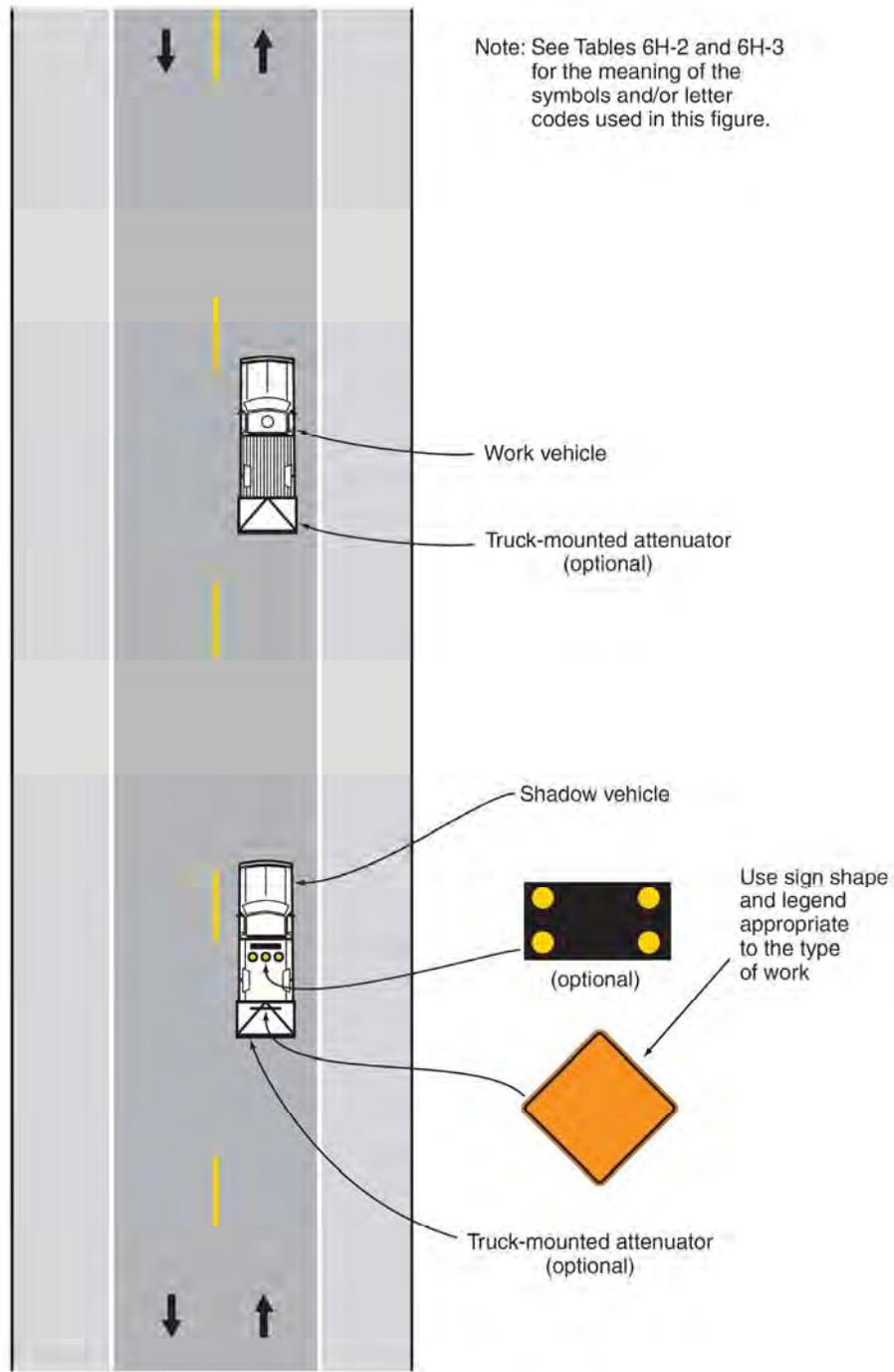
**Support:**

11. Shadow vehicles are used to warn motor vehicle traffic of the operation ahead.

**Standard:**

12. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
13. **This typical application shall not be used on State highways, Department of Transportation's Standard Plan T17 for moving lane closure shall be used instead. See Section 1A.11 for information regarding this publication.**

**Figure 6H-17. Mobile Operations on a Two-Lane Road (TA-17)**



**Typical Application 17**

### **Notes for Figure 6H-18—Typical Application 18 Lane Closure on a Minor Street**

**Standard:**

- 1. This TTC shall be used only for low-speed facilities having low traffic volumes.**

**Option:**

2. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

**Standard:**

- 3. Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in Figure ~~6H-10~~ 6H-10(CA).**

**Option:**

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.



### Notes for Figure 6H-19—Typical Application 19 Detour for One Travel Direction

*Guidance:*

1. *This plan should be used for streets without posted route numbers.*
2. *On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.*

*Option:*

3. The STREET CLOSED legend may be used in place of ROAD CLOSED.
4. Additional DO NOT ENTER signs may be used at intersections with intervening streets.
5. Warning lights may be used on Type 3 Barricades.
6. Detour signs may be located on the far side of intersections.
7. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

**Standard:**

8. **When used, the Street Name sign shall be placed above the Detour sign.**

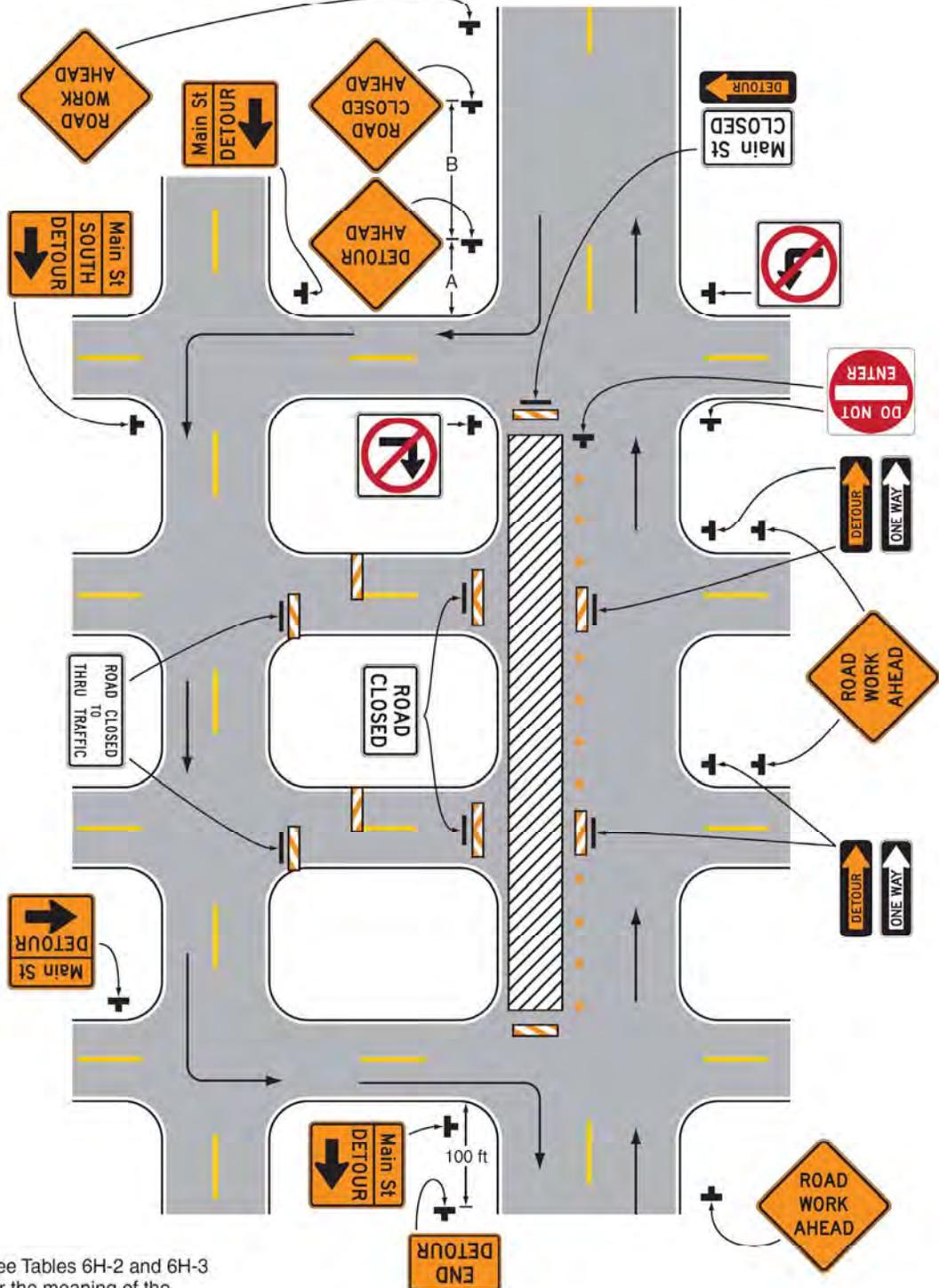
*Guidance:*

9. *The DETOUR (M4-8) sign should be placed on tangent sections at intervals not to exceed 1300 feet and at major intersections.*

*Option:*

10. *In urban areas, the M4-8 signs may be placed at every intersection.*

**Figure 6H-19. Detour for One Travel Direction (TA-19)**



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

**Typical Application 19**

### **Notes for Figure 6H-20—Typical Application 20 Detour for a Closed Street**

*Guidance:*

- 1. This plan should be used for streets without posted route numbers.*
- 2. On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.*

*Option:*

3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. Flashing warning lights may be used on Type 3 Barricades.
5. Detour signs may be located on the far side of intersections. A Detour sign with an advance arrow may be used in advance of a turn.
6. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

**Standard:**

- 7. When used, the Street Name sign shall be placed above the Detour sign.**

*Support:*

8. See Figure 6H-9 for the information for detouring a numbered highway.



### **Notes for Figure 6H-21—Typical Application 21 Lane Closure on the Near Side of an Intersection**

**Standard:**

- 1. The merging taper shall direct vehicular traffic into either the right-hand or left-hand lane, but not both.**

*Guidance:*

- 2. In this typical application, a left taper should be used so that right-turn movements will not impede through motor vehicle traffic. However, the reverse should be true for left-turn movements.*
- 3. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.*

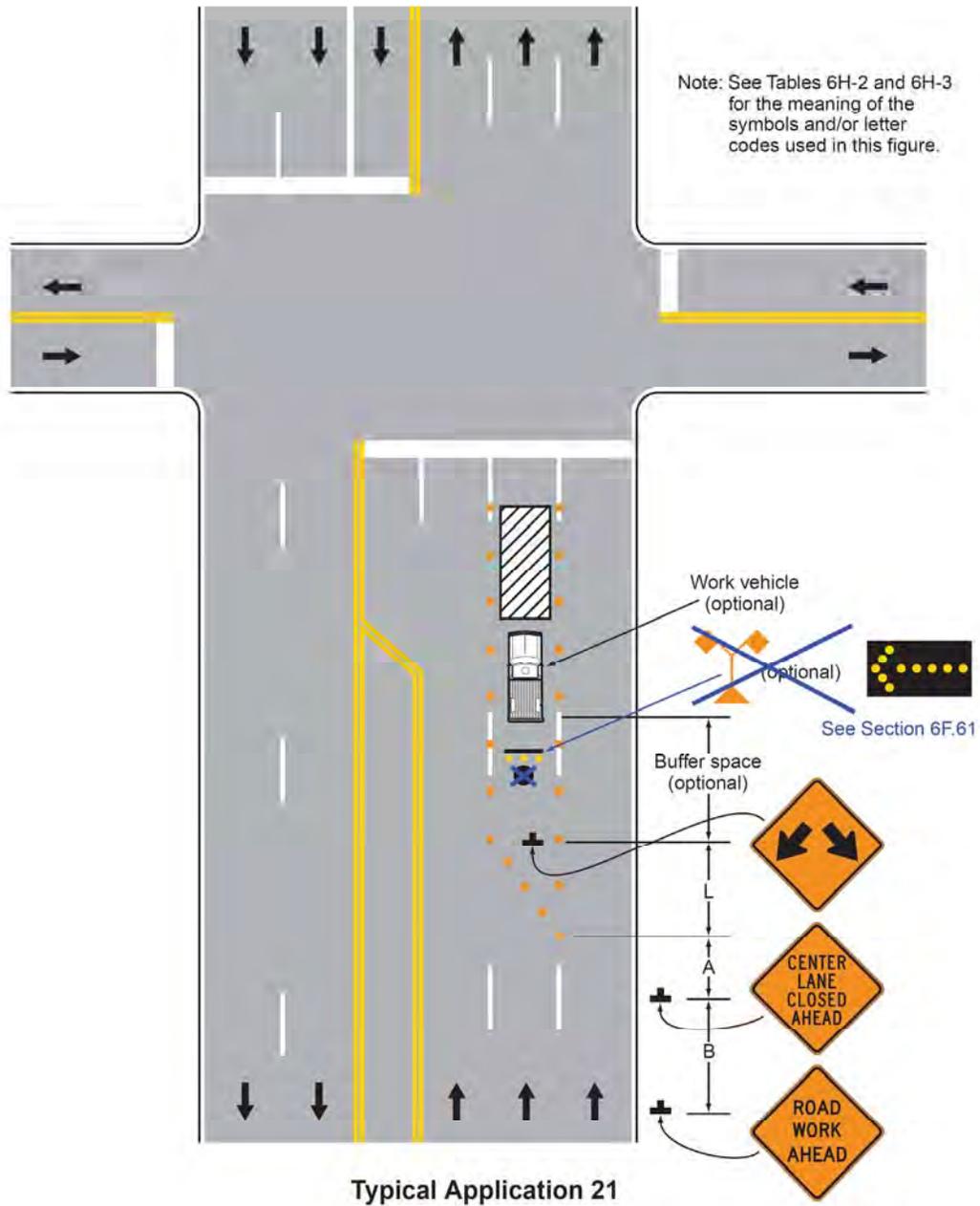
*Option:*

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A shadow vehicle with a truck-mounted attenuator may be used.
6. A work vehicle with high-intensity rotating, flashing, oscillating, or strobe lights may be used with the ~~high-level warning device~~ **arrow board**.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

**Standard:**

- 8. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Figure 6H-21. Lane Closure on the Near Side of an Intersection (TA-21)



## Notes for Figure 6H-22, 6H-22A(CA) and 6H-22B(CA) — Typical Application 22 Right-Hand Lane Closure on the Far Side of an Intersection

*Guidance:*

1. *If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.*

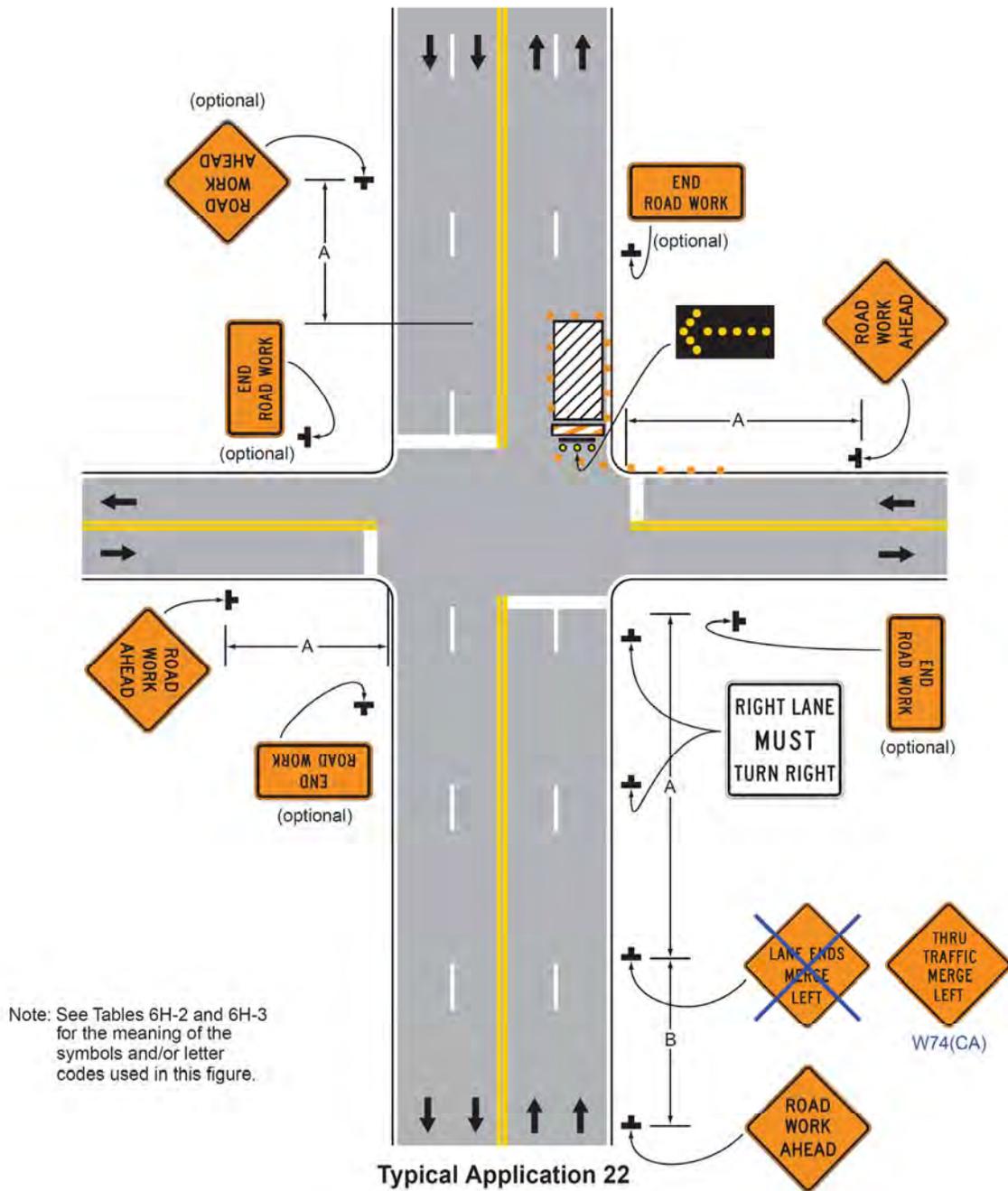
**Option:**

2. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right-hand lane having significant right turning movements, then the right-hand lane may be restricted to right turns only, as shown. This procedure increases the through capacity by eliminating right turns from the open through lane.
3. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Where the turning radius is large, it may be possible to create a right-turn island using channelizing devices or pavement markings.
6. See Figure 3B-14(CA) Page 3 of 3 for lane reduction markings. See Section 2C.40 for merge signs.

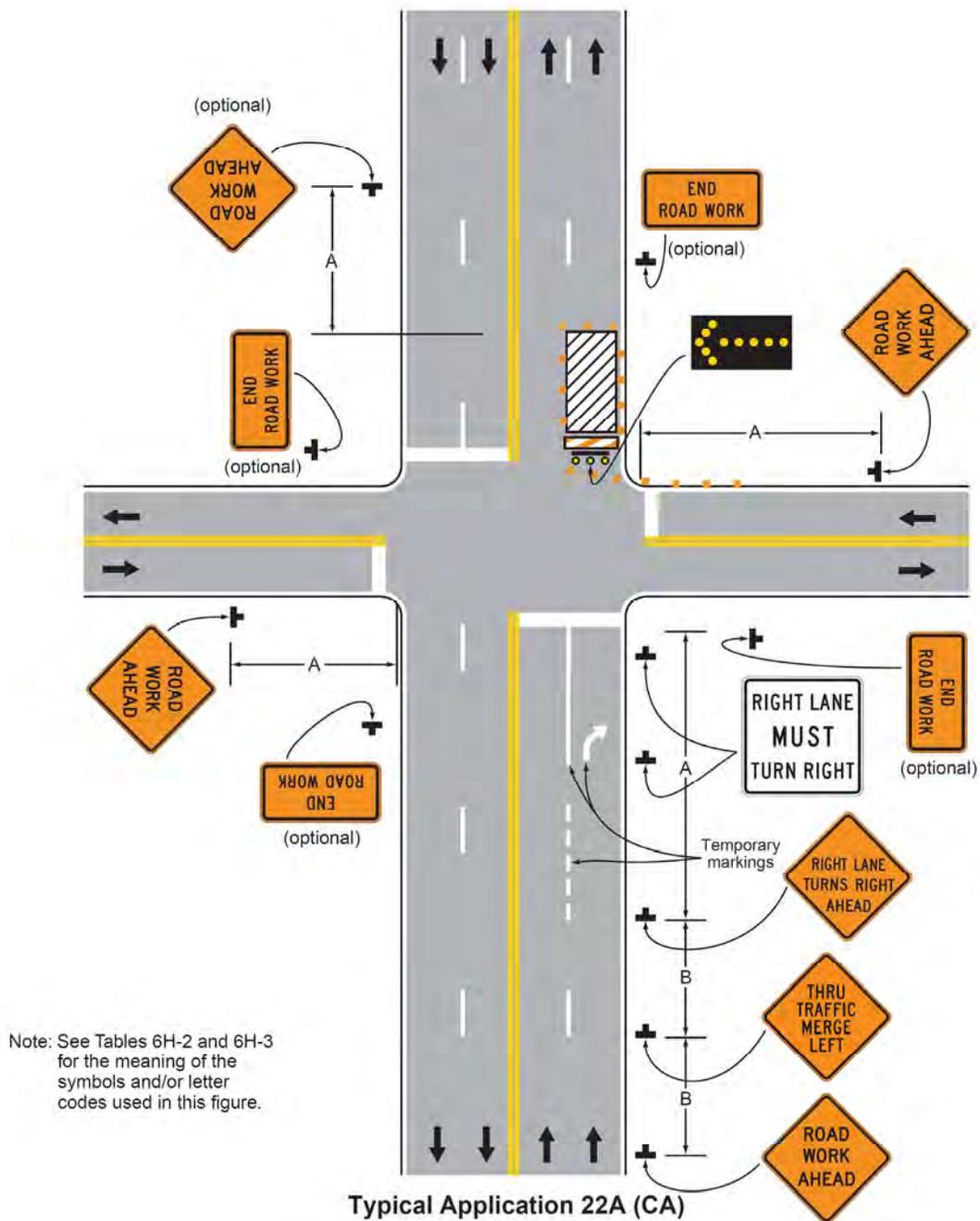
**Support:**

7. Figure 6H-22 is appropriate for short-term and intermediate-term duration where it is not appropriate to install temporary markings.
8. Figure 6H-22A(CA) is appropriate for long-term duration.
9. Figure 6H-22B(CA) is appropriate to avoid through movements from the right lane by first closing the right lane and then reopening it as a turn bay.

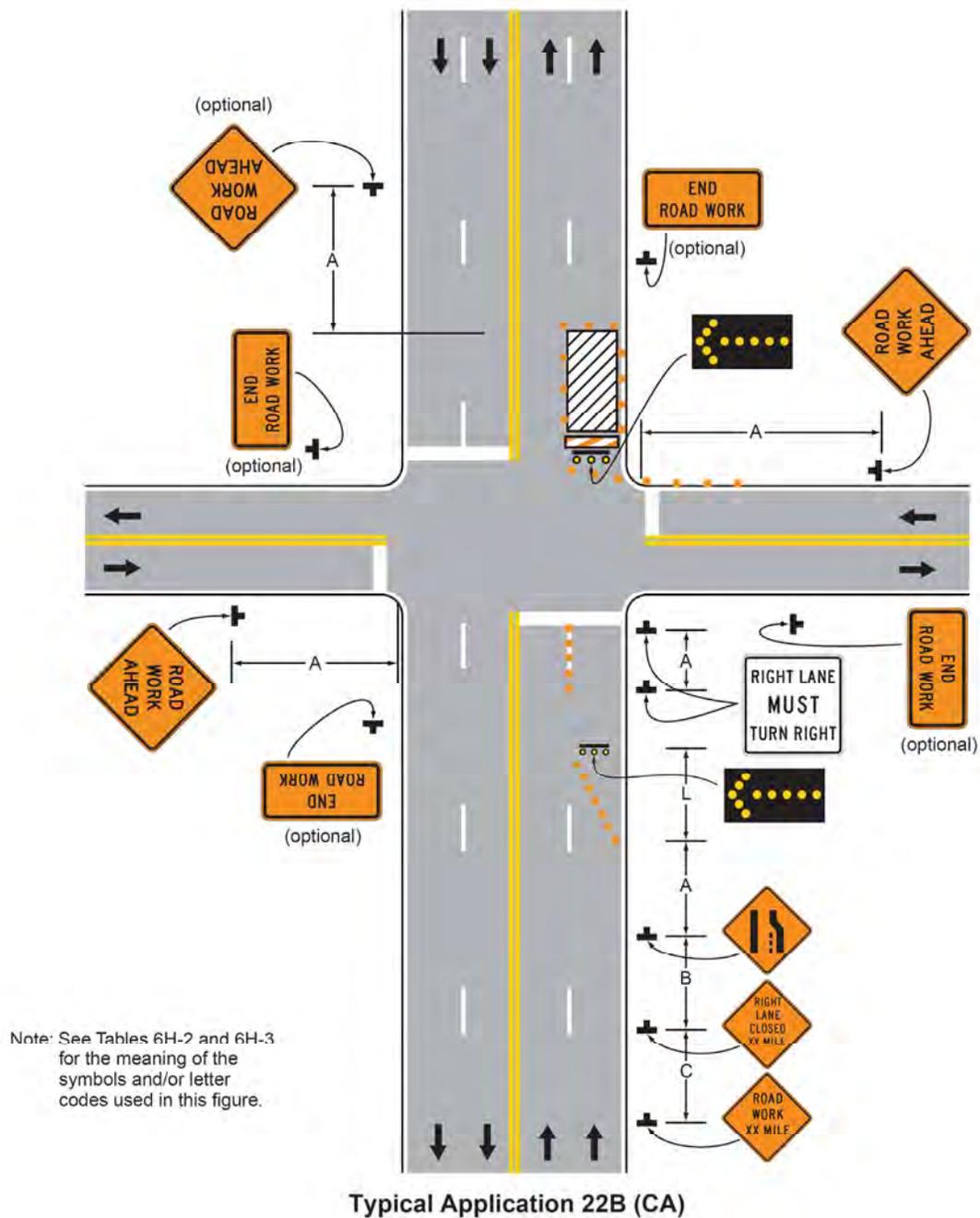
**Figure 6H-22. Right-Hand Lane Closure on the Far Side of an Intersection (TA-22)**



**Figure 6H-22A(CA). Right-Hand Lane Closure on the Far Side of an Intersection (TA-22A (CA))**



**Figure 6H-22B(CA). Right-Hand Lane Closure on the Far Side of an Intersection (TA-22B (CA))**



### **Notes for Figure 6H-23—Typical Application 23 Left-Hand Lane Closure on the Far Side of an Intersection**

*Guidance:*

- 1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.*

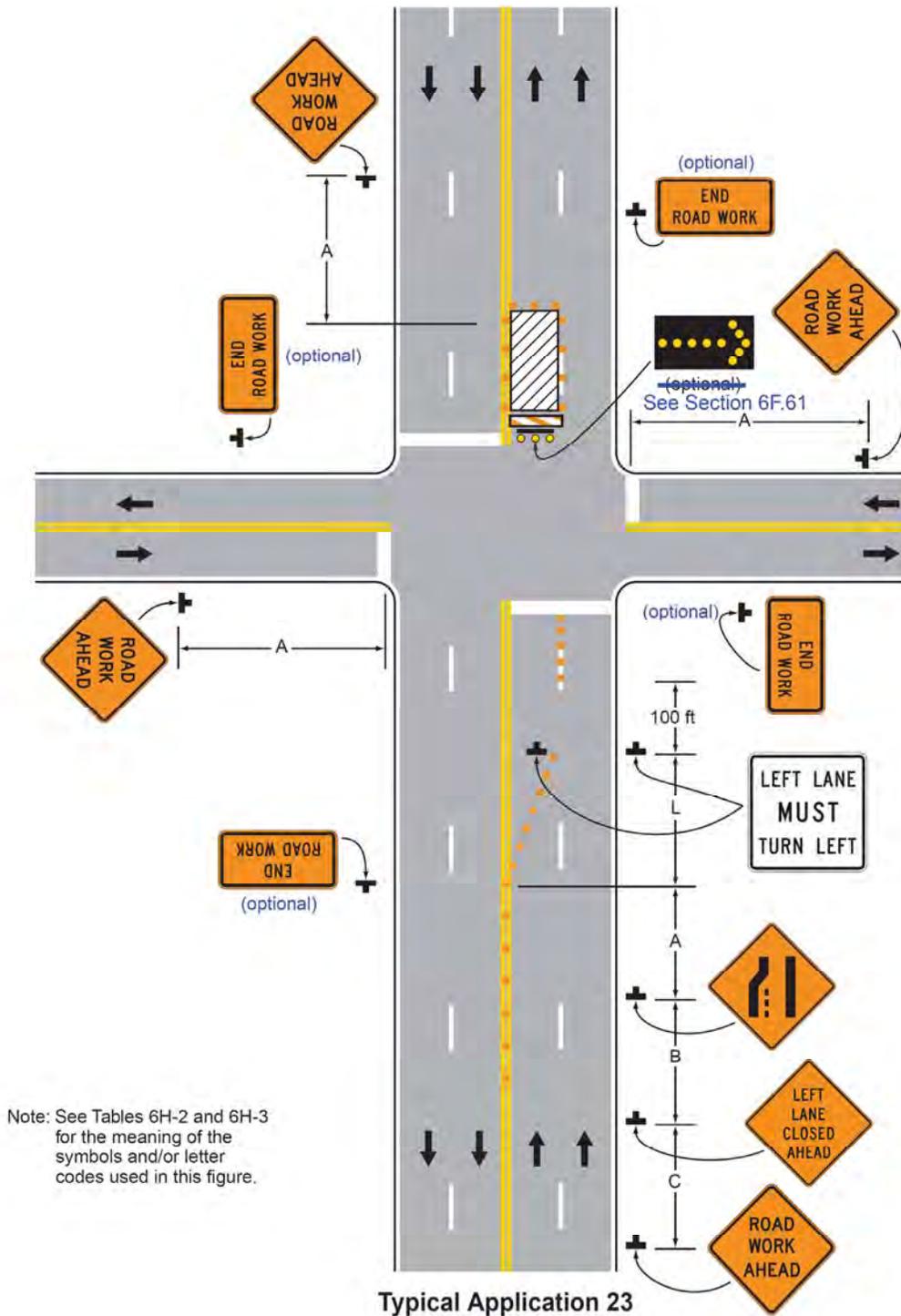
**Option:**

2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a left lane having significant left-turning movements, then the left lane may be reopened as a turn bay for left turns only, as shown.

**Support:**

4. By first closing off the left lane and then reopening it as a turn bay, the left-turn bay allows storage of turning vehicles so that the movement of through traffic is not impeded. A left-turn bay that is long enough to accommodate all turning vehicles during a traffic signal cycle will provide the maximum benefit for through traffic. Also, an island is created with channelizing devices that allows the LEFT LANE MUST TURN LEFT sign to be repeated on the left adjacent to the lane that it controls.

**Figure 6H-23. Left-Hand Lane Closure on the Far Side of an Intersection (TA-23)**



### **Notes for Figure 6H-24 and 6H-24A(CA) —Typical Application 24 Half Road Closure on the Far Side of an Intersection**

*Guidance:*

1. *If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.*
2. *When turn prohibitions are implemented, two turn prohibition signs should be used, one on the near side and, space permitting, one on the far side of the intersection.*

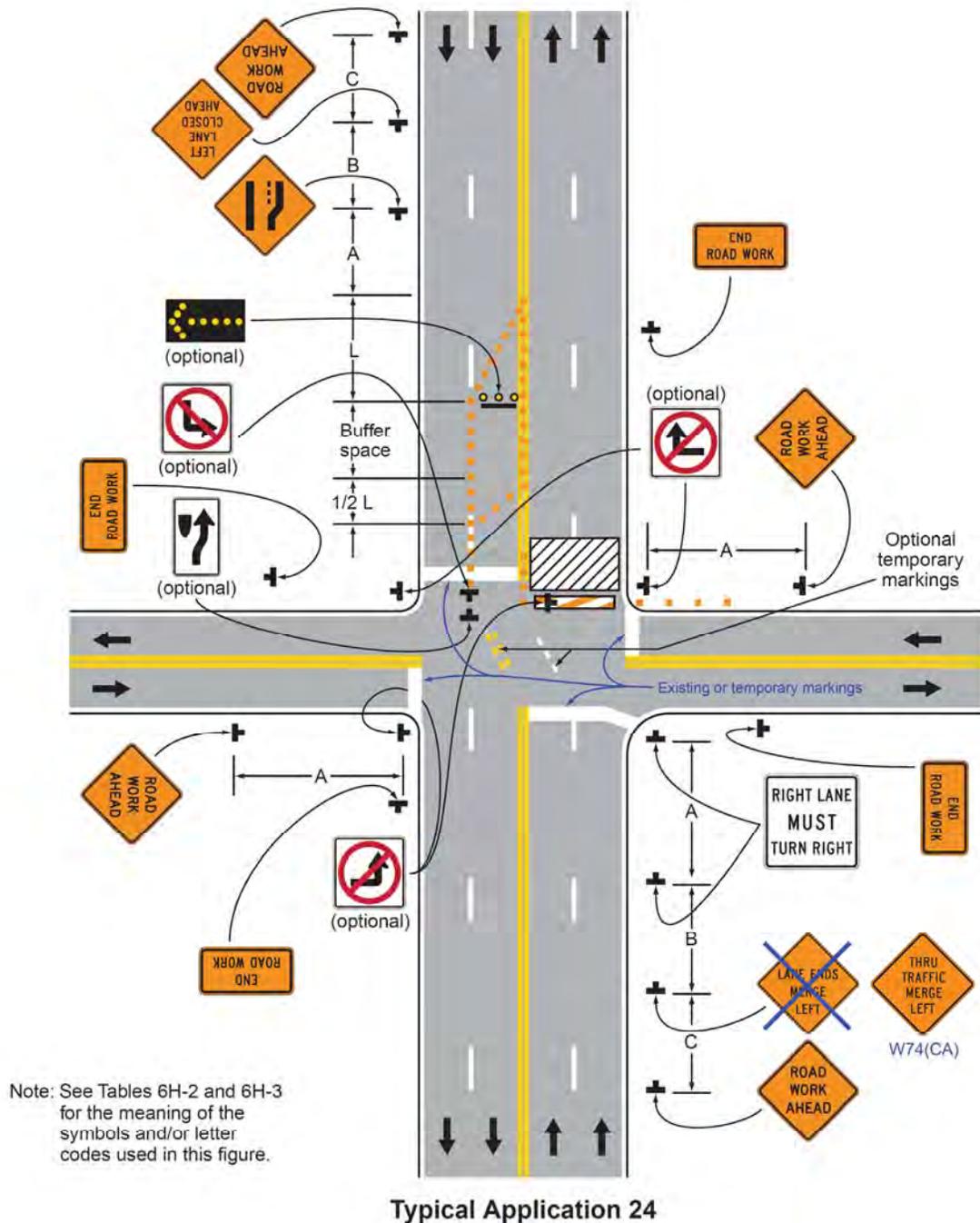
*Option:*

3. A buffer space may be used between opposing directions of vehicular traffic as shown in this application.
4. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, if there is a significant right-turning movement, then the right-hand lane may be restricted to right turns only, as shown.
5. Where the turning radius is large, a right-turn island using channelizing devices or pavement markings may be used.
6. There may be insufficient space to place the back-to-back Keep Right sign and No Left Turn symbol signs at the end of the row of channelizing devices separating opposing vehicular traffic flows. In this situation, the No Left Turn symbol sign may be placed on the right and the Keep Right sign may be omitted.
7. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.
8. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
9. Temporary pavement markings may be used to delineate the travel path through the intersection.

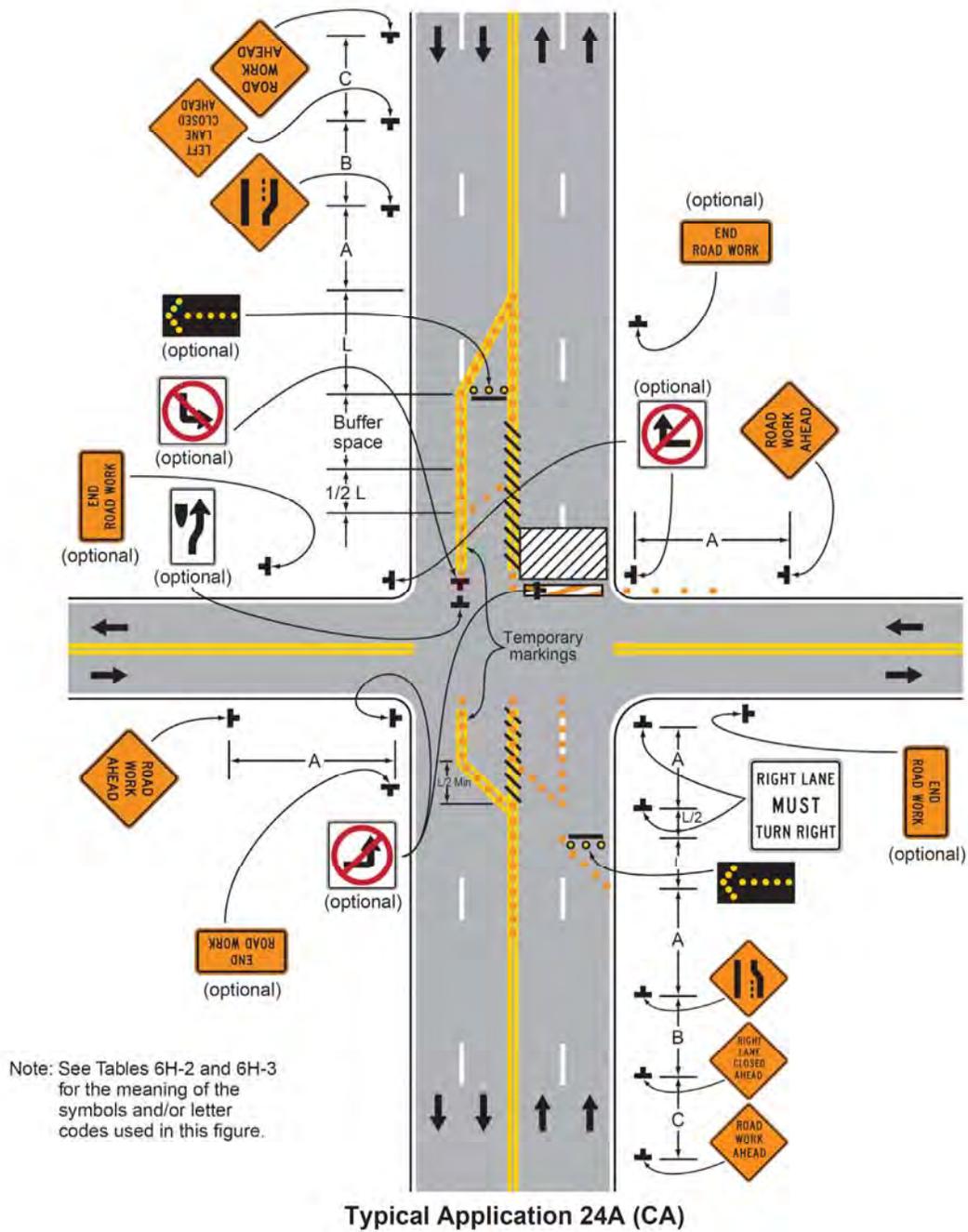
*Support:*

10. Keeping the right-hand lane open increases the through capacity by eliminating right turns from the open through lane.
11. A temporary turn island reinforces the nature of the temporary exclusive right-turn lane and enables a second RIGHT LANE MUST TURN RIGHT sign to be placed in the island.
12. Figure 6H-24 is appropriate for situations where the approach is stop-controlled (Stop sign and/or red flashing beacons) due to the abrupt transition through the intersection.
13. Figure 6H-24A(CA) is appropriate for situations where the approach is uncontrolled or controlled by traffic signals.

**Figure 6H-24. Half Road Closure on the Far Side of an Intersection (TA-24)**



**Figure 6H-24A (CA). Half Road Closure on the Far Side of an Intersection (TA-24A(CA))**



### **Notes for Figure 6H-25 and 6H-25A(CA) —Typical Application 25 Multiple Lane Closures at an Intersection**

*Guidance:*

- 1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.*
- 2. If the left through lane is closed on the near-side approach, the LEFT LANE MUST TURN LEFT sign should be placed in the median to discourage through vehicular traffic from entering the left-turn bay.*

**Support:**

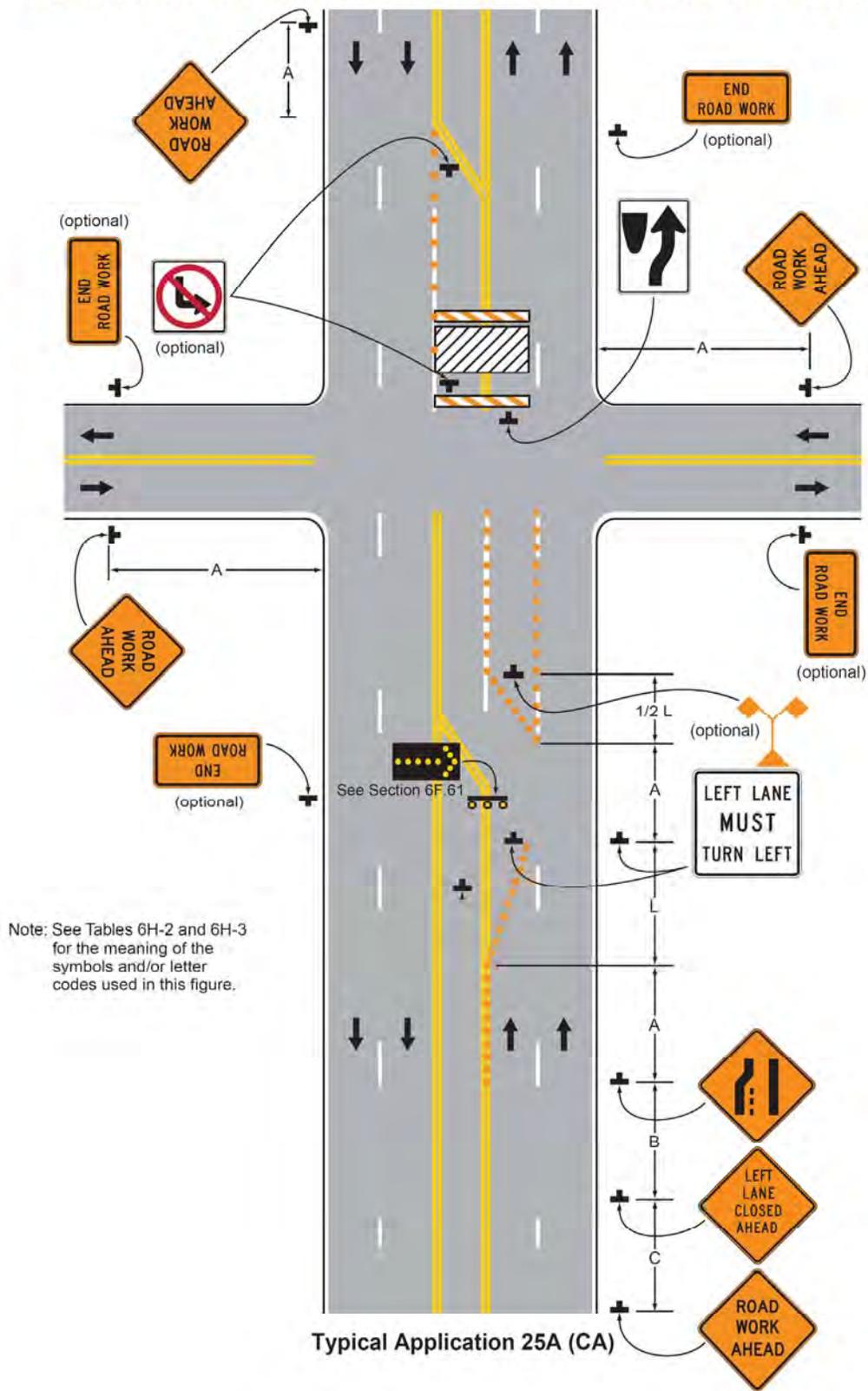
3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection (see Figure 6H-25A(CA)).

**Option:**

4. If the left-turning movement that normally uses the closed turn bay is small and/or the gaps in opposing vehicular traffic are frequent, left turns may be permitted on that approach.
5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.



**Figure 6H-25A (CA). Multiple Lane Closures at an Intersection (TA-25A(CA))**



### Notes for Figure 6H-26—Typical Application 26 Closure in the Center of an Intersection

*Guidance:*

1. All lanes should be a minimum of 10 feet in width as measured to the near face of the channelizing devices.

*Option:*

2. A high-level warning device may be placed in the work space, if there is sufficient room.
3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 9 feet may be used.

**Standard:**

**Note #3 is not applicable for State highways. Note #1 shall be used instead for State highways.**

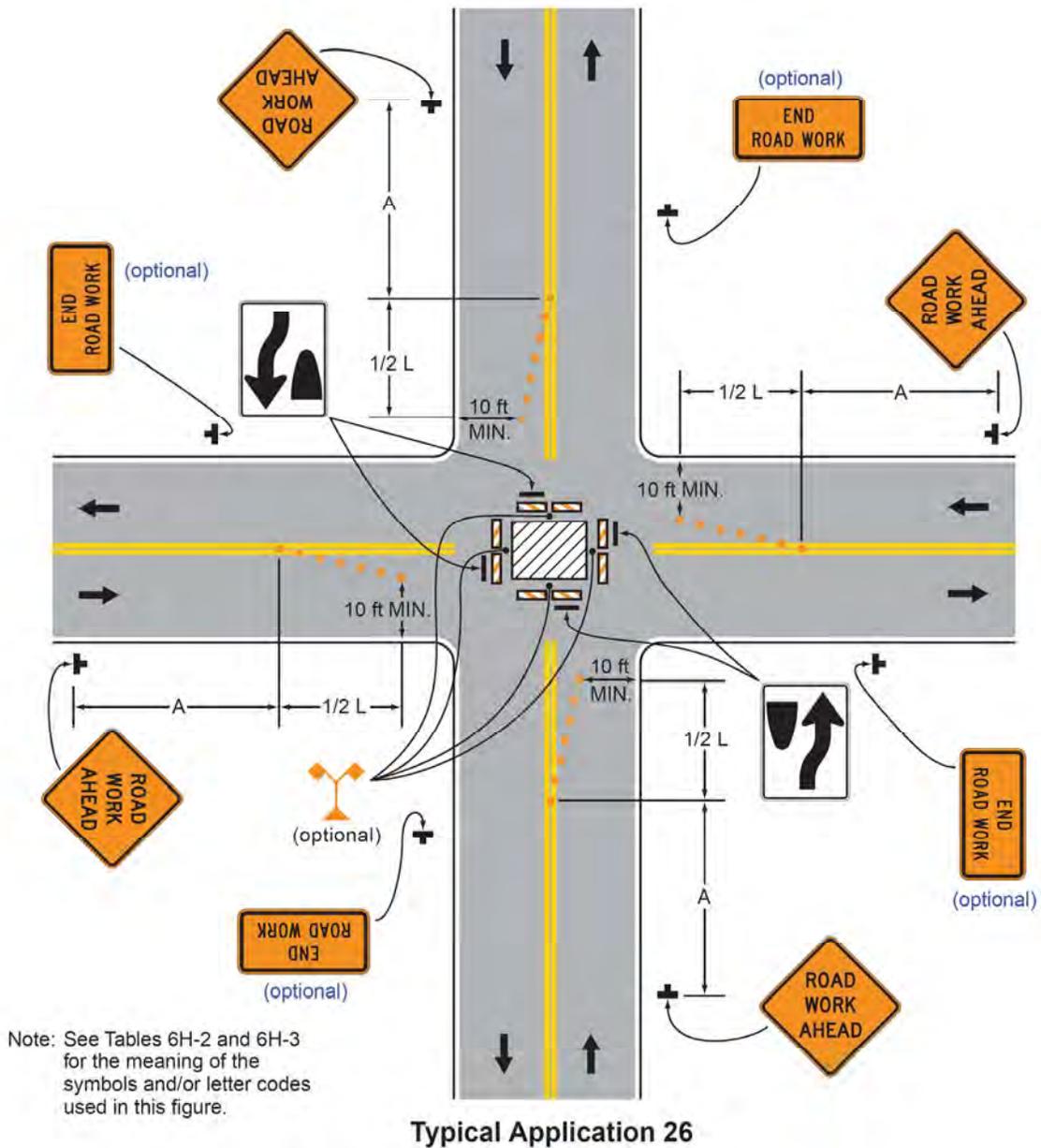
*Option:*

4. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
5. Unless the streets are wide, it may be physically impossible to turn left, especially for large vehicles. Left turns may be prohibited as required by geometric conditions.
6. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

**Standard:**

- 8. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

**Figure 6H-26. Closure in the Center of an Intersection (TA-26)**



### Notes for Figure 6H-27—Typical Application 27 Closure at the Side of an Intersection

*Guidance:*

1. *The situation depicted can be simplified by closing one or more of the intersection approaches. If this cannot be done, and/or when capacity is a problem, through vehicular traffic should be directed to other roads or streets.*
2. *Depending on road user conditions, flagger(s) or uniformed law enforcement officer(s) should be used to direct road users within the intersection.*

**Standard:**

3. **At night, flagger stations shall be illuminated, except in emergencies.**

*Option:*

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
6. A BE PREPARED TO STOP sign may be added to the sign series.

*Guidance:*

7. *When used, the BE PREPARED TO STOP sign should be located ~~before~~ after the Flagger symbol sign.*
8. *ONE LANE ROAD AHEAD signs should also be used to provide adequate advance warning.*

*Support:*

9. Turns can be prohibited as required by vehicular traffic conditions. Unless the streets are wide, it might be physically impossible to make certain turns, especially for large vehicles.

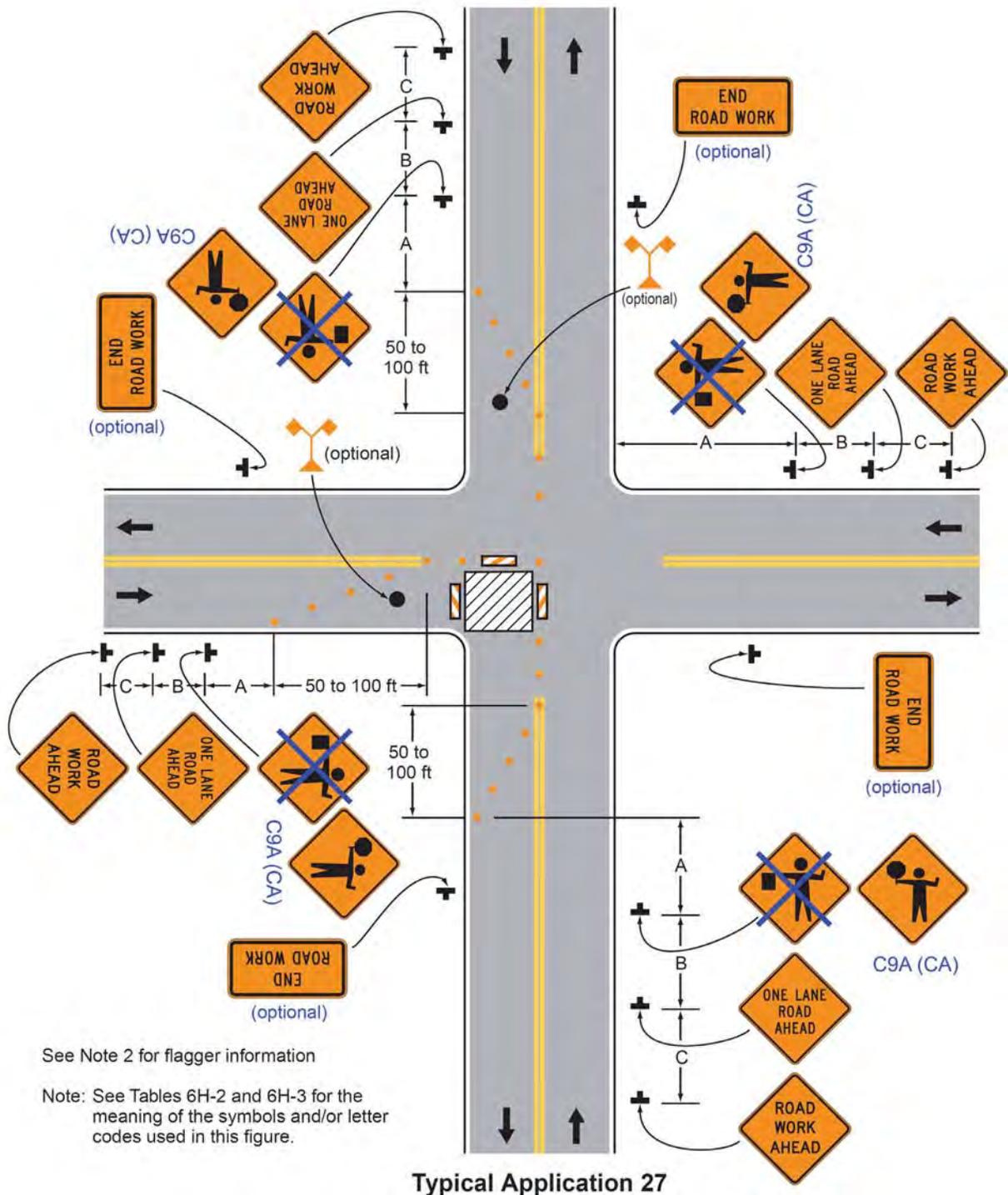
*Option:*

10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

**Standard:**

11. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

**Figure 6H-27. Closure at the Side of an Intersection (TA-27)**



## Notes for Figure 6H-28—Typical Application 28 Sidewalk Detour or Diversion

### Standard:

1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

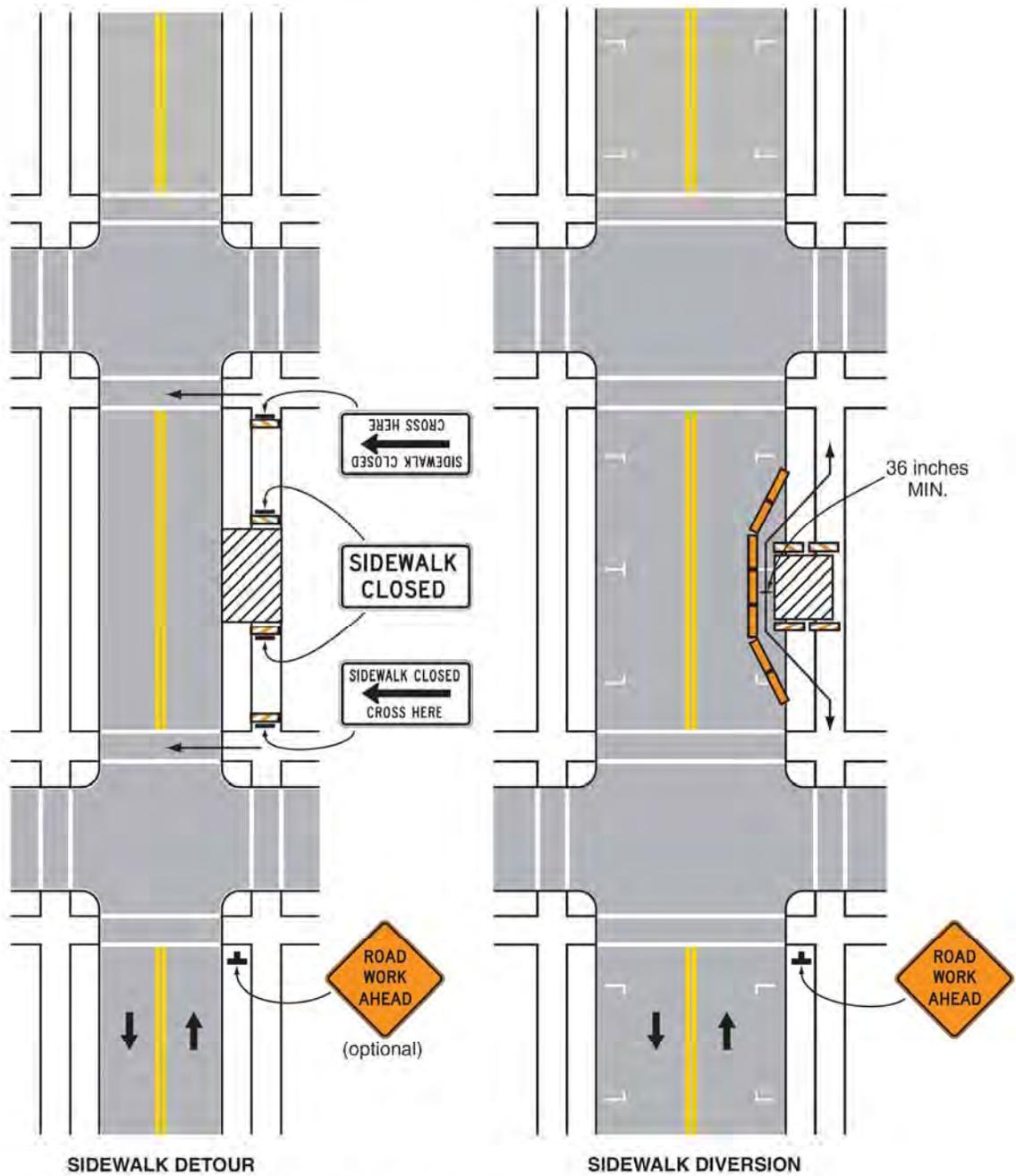
### Guidance:

2. Where high speeds are anticipated, a temporary traffic barrier and, if necessary, a crash cushion should be used to separate the temporary sidewalks from vehicular traffic.
3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.

### Option:

4. Street lighting may be considered.
5. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
6. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.
7. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the temporary sidewalks from vehicular traffic flow.
8. Signs, such as KEEP RIGHT (LEFT), may be placed along a temporary sidewalk to guide or direct pedestrians.

**Figure 6H-28. Sidewalk Detour or Diversion (TA-28)**



**Typical Application 28**

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

## Notes for Figure 6H-29—Typical Application 29 Crosswalk Closures and Pedestrian Detours

### Standard:

1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.
2. ~~Curb parking shall be prohibited for at least 50 feet in advance of the midblock crosswalk.~~

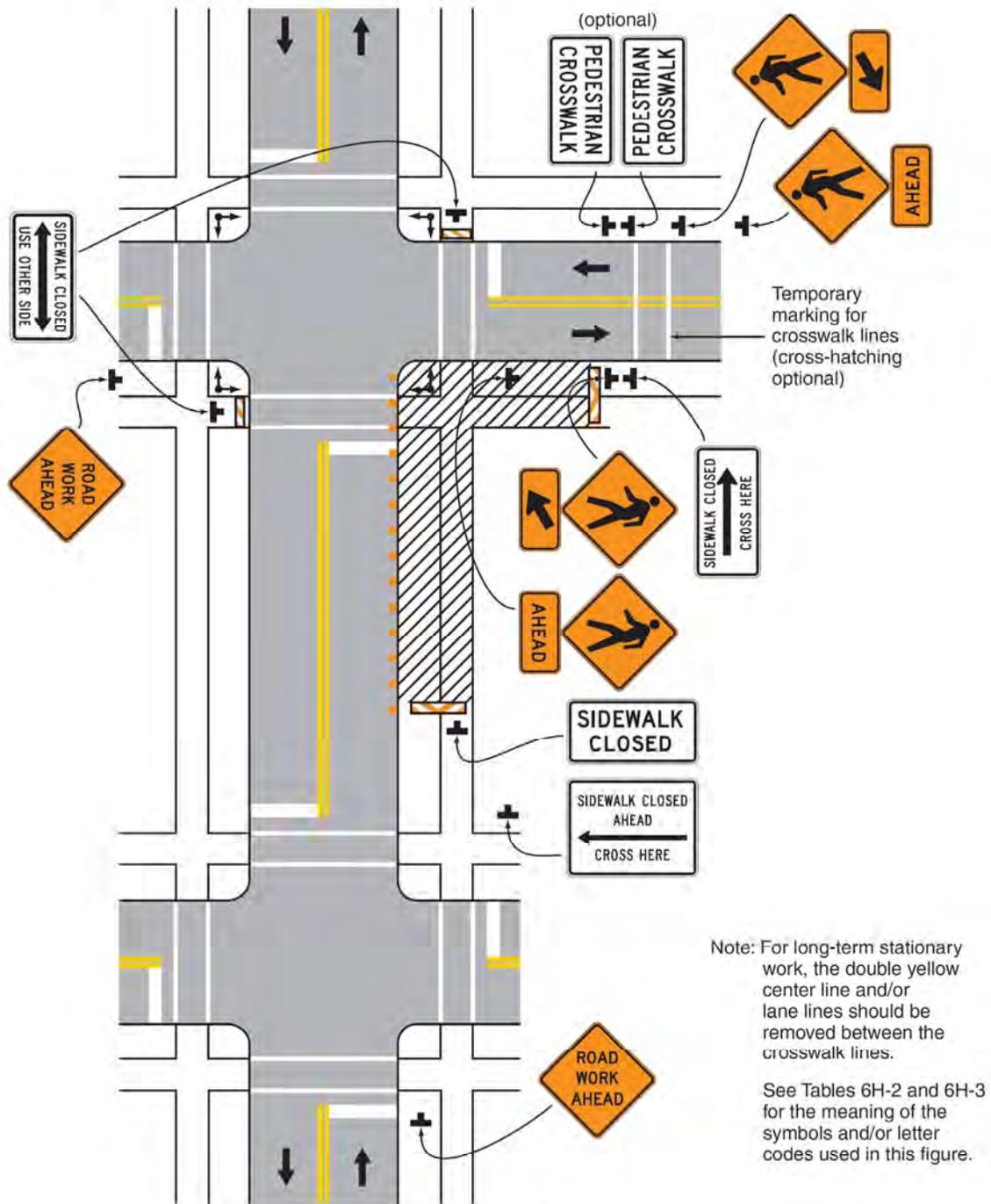
### Guidance:

2. *Parking should be prohibited in advance of mid-block crosswalks. Mid-block crosswalks should be avoided, when possible. See Section 3B.18.*
3. *Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.*
4. *Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.*

### Option:

5. Street lighting may be considered.
6. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
7. For nighttime closures, Type A Flashing warning lights may be used on barricades supporting signs and closing sidewalks.
8. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the work space from vehicular traffic.
9. In order to maintain the systematic use of the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs in a jurisdiction, the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.

**Figure 6H-29. Crosswalk Closures and Pedestrian Detours (TA-29)**



**Typical Application 29**

### **Notes for Figure 6H-30—Typical Application 30 Interior Lane Closure on a Multi-Lane Street**

*Guidance:*

- 1. This information applies to low-speed, low-volume urban streets. Where speed or volume is higher, additional signing such as LEFT LANE CLOSED XX FT should be used between the signs shown.*

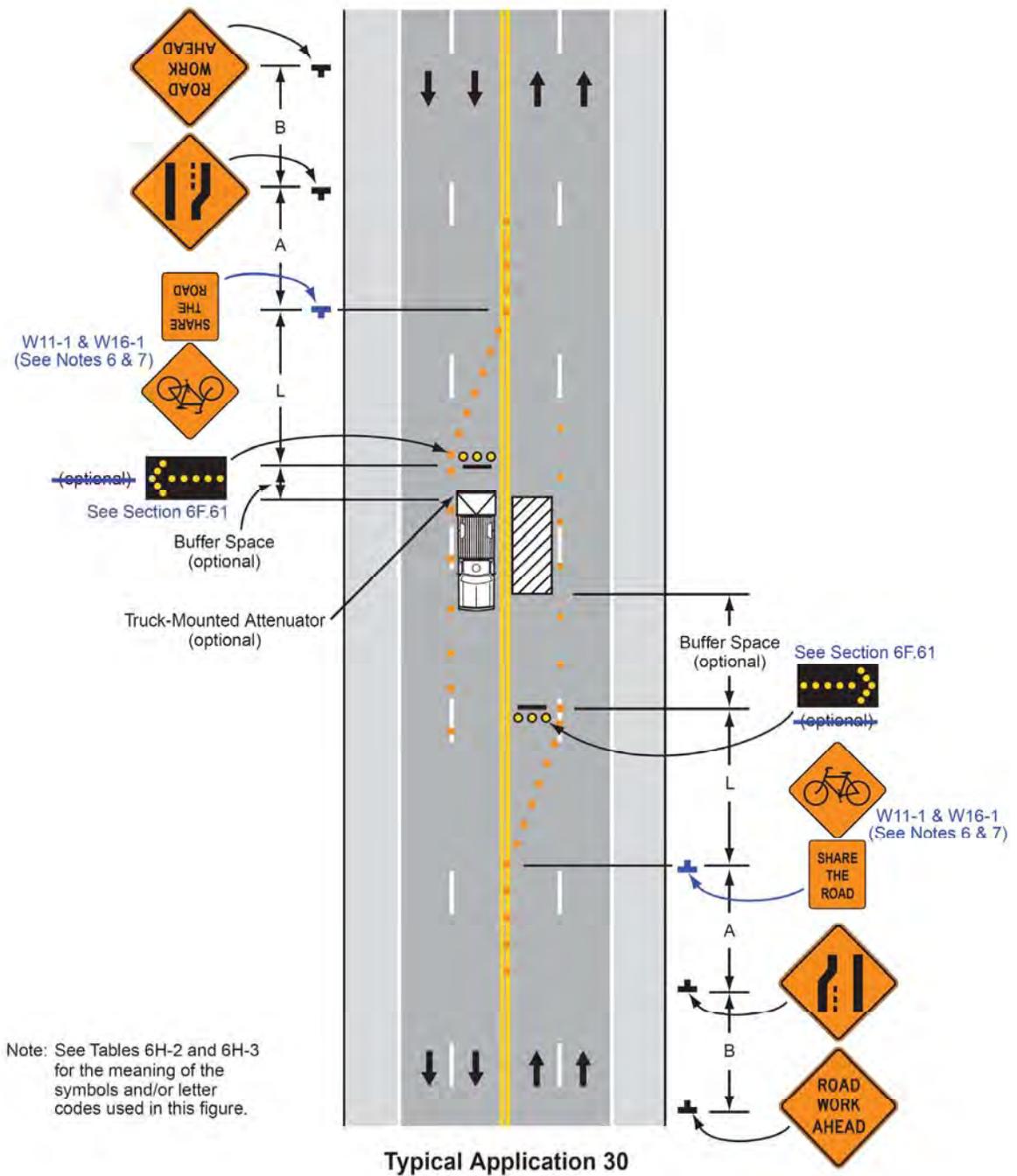
*Option:*

- 2. The closure of the adjacent interior lane in the opposing direction may not be necessary, depending upon the activity being performed and the work space needed for the operation.*
- 3. Shadow vehicles with a truck-mounted attenuator may be used.*
- 4. The RIGHT (LEFT) LANE(S) CLOSED (W20-5 or C20(CA)) sign may be used instead of the Lane Reduction (W4-2) sign.*

*Guidance:*

- 5. All advance warning signs should be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.*
- 6. When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (see Section 6G.02) and the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, the Bicycle Crossing (W11-1) sign and the SHARE THE ROAD (W16-1P) plaque should be used to advise motorists of the presence of bicyclists in the travel way lanes.*
- 7. If bicyclists are able to use the shoulder throughout the TTC zone, the Bicycle Crossing (W11-1) sign and the SHARE THE ROAD (W16-1P) plaque should be omitted.*

**Figure 6H-30. Interior Lane Closure on Multi-lane Street (TA-30)**



### Notes for Figure 6H-31 — Typical Application 31 Lane Closure on a Street with Uneven Directional Volumes

**Standard:**

1. The illustrated information shall be used only when the vehicular traffic volume indicates that two lanes of vehicular traffic shall be maintained in the direction of travel for which one lane is closed.

**Option:**

2. The procedure may be used during a peak period of vehicular traffic and then changed to provide two lanes in the other direction for the other peak.

**Guidance:**

3. For high speeds, a *LEFT LANE CLOSED XX FT* sign should be added for vehicular traffic approaching the lane closure, as shown in Figure ~~6H-32~~ 6H-32(CA).
4. Conflicting pavement markings should be removed for long-term projects. For short-term and intermediate-term projects where this is not practical, the channelizing devices in the area where the pavement markings conflict should be placed at a maximum spacing of  $1/2 S$  feet where  $S$  is the speed in mph. Temporary markings should be installed where needed. The spacing of channelizing devices should not exceed the maximum distances shown in Table 6F-101(CA). Refer to Section 6F.63 for spacing of channelizing devices.
5. If the lane shift has curves with recommended speeds of 30 mph or less, Reverse Turn signs should be used.
6. Where the shifted section is long, a Reverse Curve sign should be used to show the initial shift and a second sign should be used to show the return to the normal alignment.
7. If the tangent distance along the temporary diversion is less than 600 feet, the Double Reverse Curve sign should be used at the location of the first Two Lane Reverse Curve sign. The second Two Lane Reverse Curve sign should be omitted. Use the Reverse Curve (W1-4) signs for both locations instead of the Double Reverse Curve or Two Lane Reverse Curve signs.

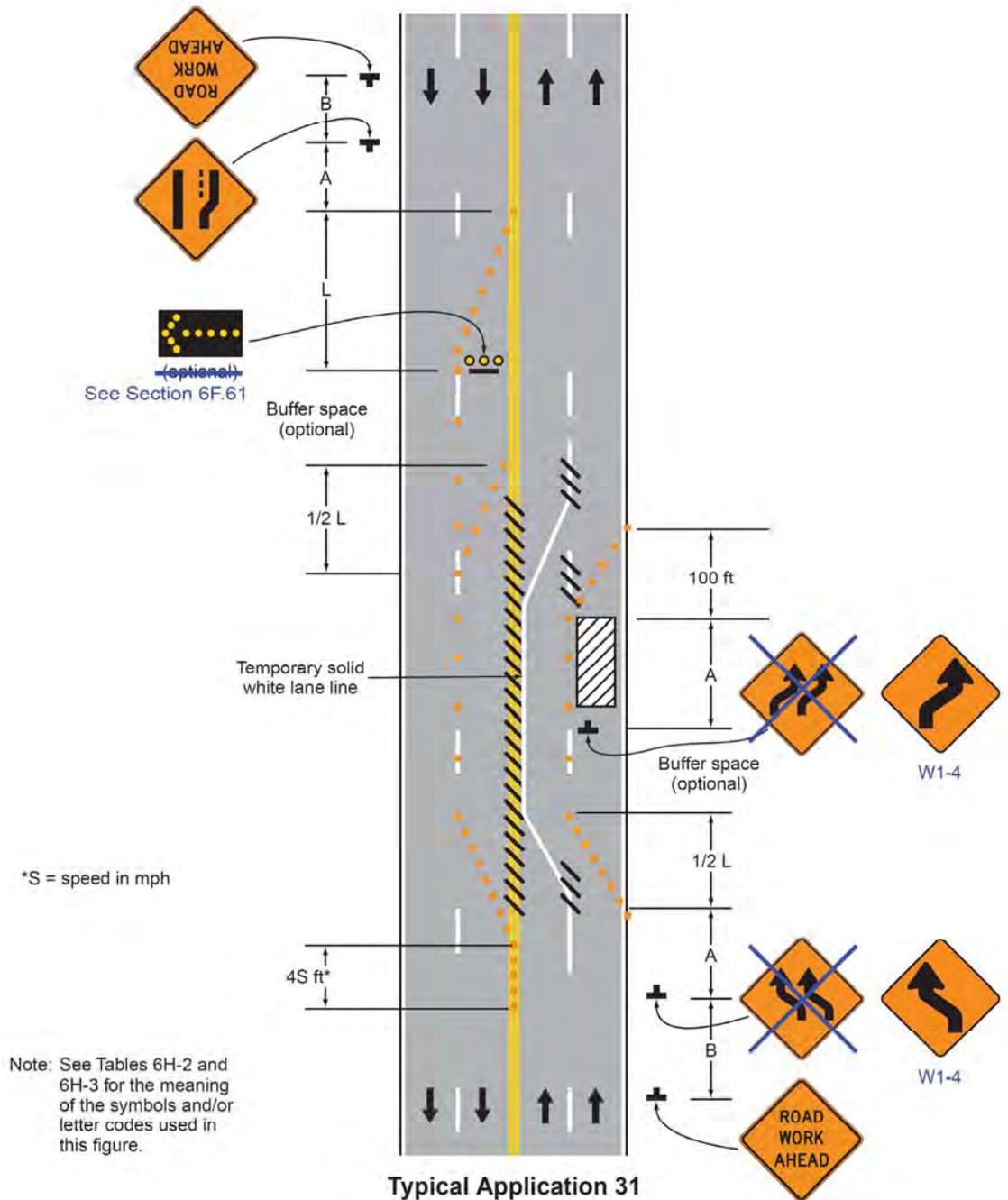
**Standard:**

8. ~~The number of lanes illustrated on the Reverse Curve or Double Reverse Curve signs shall be the same as the number of through lanes available to road users, and the direction of the reverse curves shall be appropriately illustrated.~~ Curve warning signs with multiple arrows shall not be used in California. Only W1-3, W1-4 and W24-1 signs shall be used.

**Option:**

9. A longitudinal buffer space may be used in the activity area to separate opposing vehicular traffic.
10. Where two or more lanes are being shifted, a W1-4 (or W1-3) sign with an ALL LANES (W24-1cP) plaque (see Figure 6F-4) may be used instead of a sign that illustrates the number of lanes. Use Reverse Curve (W1-4) sign instead of ALL LANES THRU Plaque.
11. Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.
12. A work vehicle or a shadow vehicle may be equipped with a truck-mounted attenuator.

**Figure 6H-31. Lane Closures on a Street with Uneven Directional Volumes (TA-31)**



## Notes for Figure ~~6H-32~~ 6H-32(CA) — Typical Application 32 Half Road Closure on a Multi-Lane, High-Speed Highway

### Standard:

1. Pavement markings no longer applicable shall be removed or obliterated as soon as practical. Except for intermediate-term and short-term situations, temporary markings shall be provided to clearly delineate the temporary travel path. For short-term and intermediate-term situations where it is not feasible to remove and restore pavement markings, channelization shall be made dominant by using a very close device spacing.

### Guidance:

2. When paved shoulders having a width of 8 feet or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
3. Where channelizing devices are used instead of pavement markings, the maximum spacing should be  $1/2 S$  feet where  $S$  is the speed in mph. The spacing of channelizing devices should not exceed the maximum distances shown in Table 6F-101(CA). Refer to Section 6F.63 for spacing of channelizing devices.
4. If the tangent distance along the temporary diversion is less than 600 feet, a Double Reverse Curve sign should be used instead of the first Reverse Curve sign, and the second Reverse Curve sign should be omitted.

### Option:

5. Warning lights may be used to supplement channelizing devices at night.
6. A truck-mounted attenuator may be used on the work vehicle and/or the shadow vehicle.

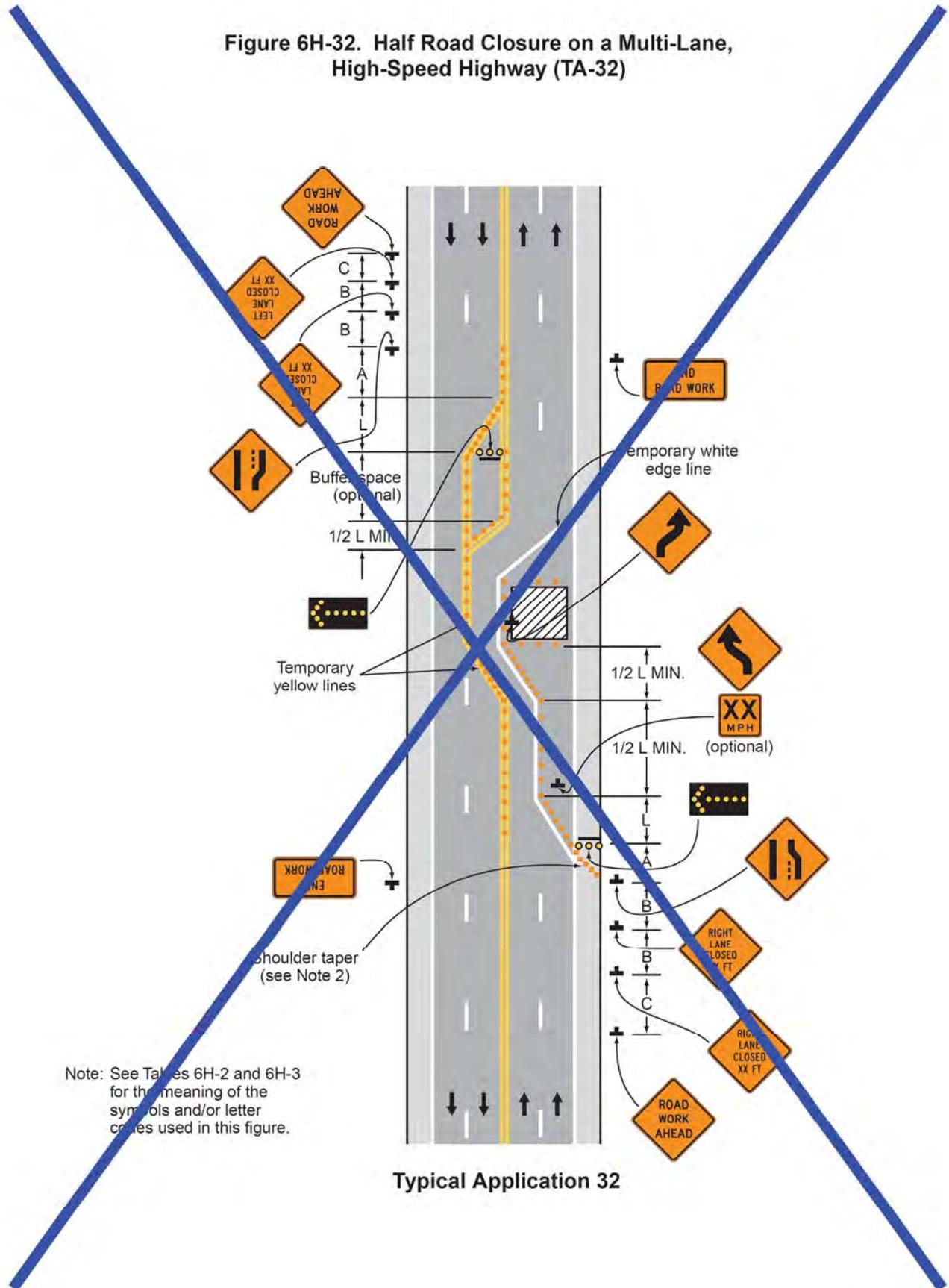
### Support:

7. See Section 6F.106(CA) for use of the Slow For The Cone Zone (SC19(CA) and SC20(CA)) Signs.

### Guidance:

8. All advance warning signs should be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.
9. If bicyclists are able to use the shoulder throughout the TTC zone, the Bicycle Crossing (W11-1) sign should be used and the SHARE THE ROAD (W16-1P) plaque should be omitted.
10. The speeds used for the shoulder taper calculations should be of bicyclists in the project vicinity or if a special event such as a bike race, the expected speed of bicyclists approaching the TTC zone.
11. If bicyclists are sharing the traveled way lanes with motorists, speed reduction countermeasures should be used to reduce traffic speeds in the TTC zone. Refer to Sections 6C.01 and 6D.03.
12. When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (see Section 6G.02) and the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, the Bicycle Crossing (W11-1) sign and the SHARE THE ROAD (W16-1P) plaque should be used to advise motorists of the presence of bicyclists in the travel way lanes.

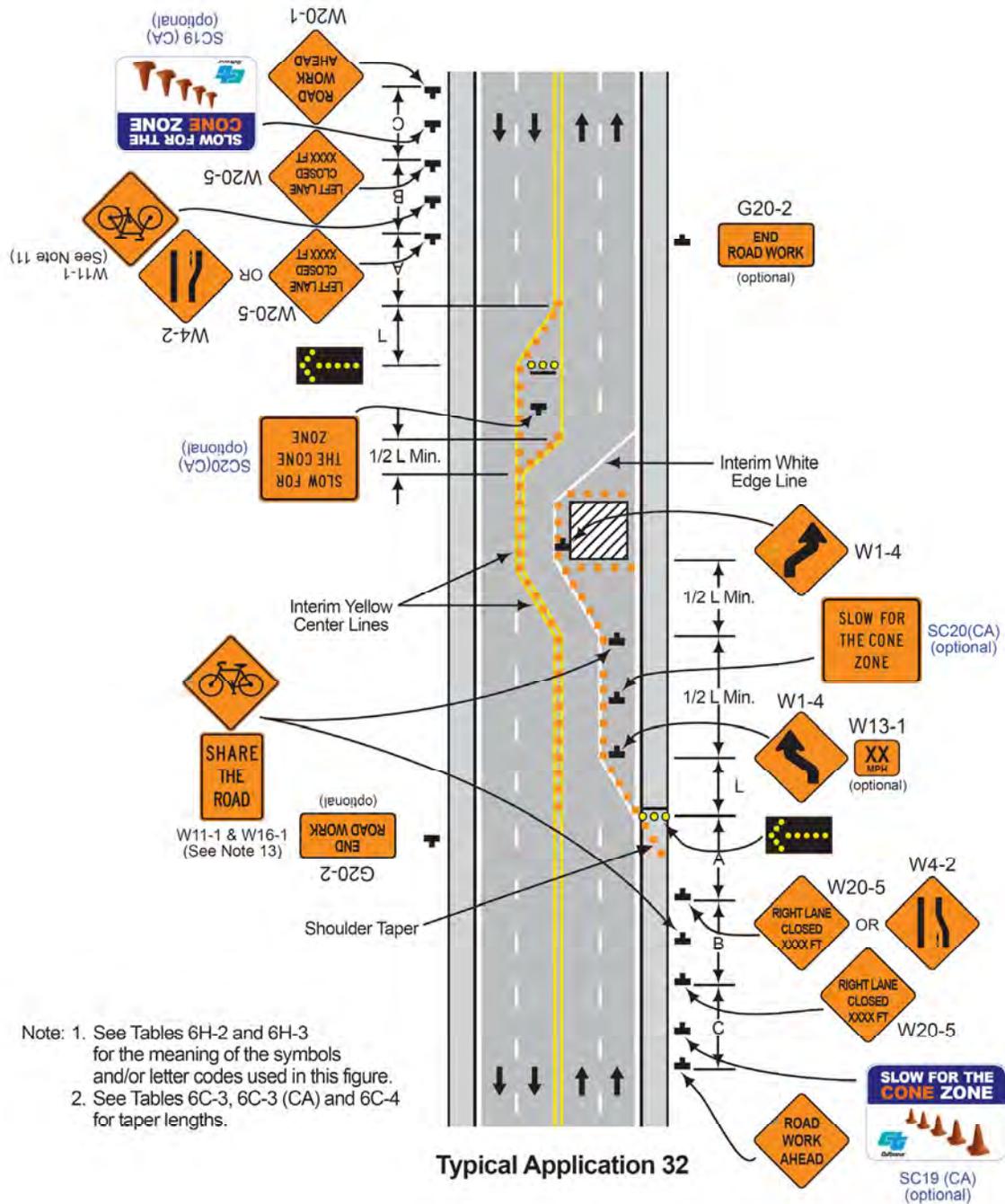
**Figure 6H-32. Half Road Closure on a Multi-Lane, High-Speed Highway (TA-32)**



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

**Typical Application 32**

**Figure 6H-32 (CA). Half Road Closure on a Multilane, High-Speed Highway (TA-32)**



### Notes for Figure 6H-33 — Typical Application 33 Stationary Lane Closure on a Divided Highway

**Standard:**

- 1. This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.**
- 2. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed as needed.**

*Guidance:*

- 3. When paved shoulders having a width of 8 feet or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.*

**Option:**

4. A truck-mounted attenuator may be used on the work vehicle and/or shadow vehicle.

**Support:**

5. Where conditions permit, restricting all vehicles, equipment, workers, and their activities to one side of the roadway might be advantageous.

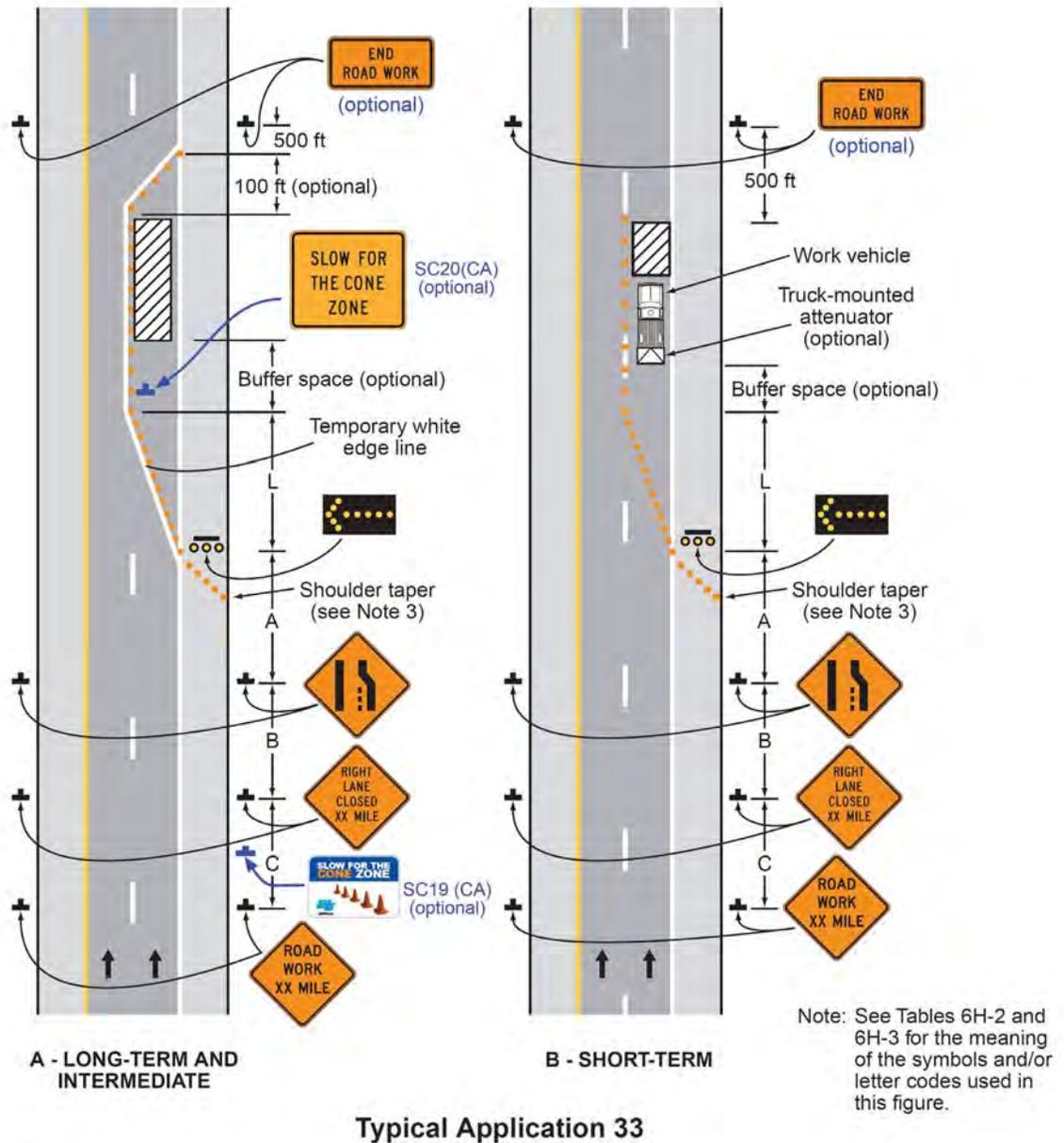
**Standard:**

- 6. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

**Support:**

7. See Section 6F.106(CA) for use of the Slow For The Cone Zone (SC19(CA) and SC20(CA)) Signs.

**Figure 6H-33. Stationary Lane Closure on a Divided Highway (TA-33)**



### Notes for Figure 6H-34—Typical Application 34 Lane Closure with a Temporary Traffic Barrier

**Standard:**

- 1. This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.**

*Guidance:*

- 2. For long-term lane closures on facilities with permanent edge lines, a temporary edge line should be installed from the upstream end of the merging taper to the downstream end of the downstream taper, and conflicting pavement markings should be removed.*
- 3. The use of a barrier should be based on engineering judgment.*

**Standard:**

- 4. Temporary traffic barriers, if used, shall comply with the provisions of Section 6F.85.**
- 5. The barrier shall not be placed along the merging taper. The lane shall first be closed using channelizing devices and pavement markings.**

*Option:*

- 6. Type C Steady-Burn warning lights may be placed on channelizing devices and the barrier parallel to the edge of pavement for nighttime lane closures.*
- 7. The barrier shown in this typical application is an example of one method that may be used to close a lane for a long-term project. If the work activity permits, a movable barrier may be used and relocated to the shoulder during non-work periods or peak-period vehicular traffic conditions, as appropriate.*

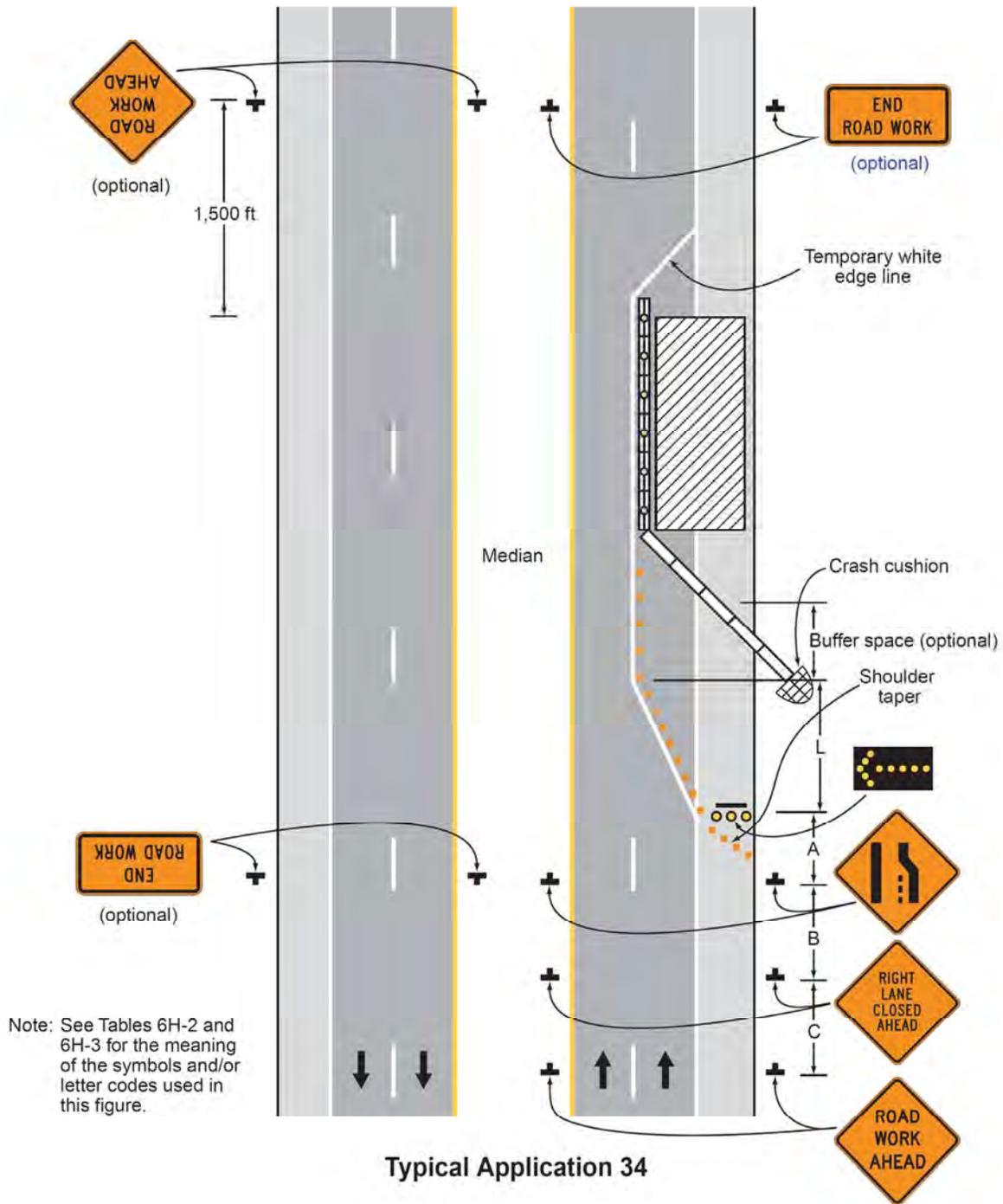
**Standard:**

- 8. If a movable barrier is used, the temporary white edge line shown in the typical application shall not be used. During the period when the right-hand lane is opened, the sign legends and the channelization shall be changed to indicate that only the shoulder is closed, as illustrated in Figure ~~6H-5~~ 6H-5(CA). The arrow board, if used, shall be placed at the downstream end of the shoulder taper and shall display the caution mode.**

*Guidance:*

- 9. If a movable barrier is used, the shift should be performed in the following manner. When closing the lane, the lane should be initially closed with channelizing devices placed along a merging taper using the same information employed for a stationary lane closure. The lane closure should then be extended with the movable-barrier transfer vehicle moving with vehicular traffic. When opening the lane, the movable barrier transfer vehicle should travel against vehicular traffic from the termination area to the transition area. The merging taper should then be removed using the same information employed for a stationary lane closure.*

**Figure 6H-34. Lane Closure with a Temporary Traffic Barrier (TA-34)**



### Notes for Figure 6H-35—Typical Application 35 Mobile Operation on a Multi-Lane Road

**Standard:**

1. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches. For State highways, the arrow boards shall, as a minimum, be type II, with a size of 72 x 36 inch. Refer to Department of Transportation's Standard Specifications Section 12-3.03 for minimum size and type of arrow panels cited above. See Section 1A.11 for information regarding this publication.
2. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.
3. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.
4. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.

*Guidance:*

5. Vehicles used for these operations should be made highly visible with appropriate equipment, such as flags, signs, or arrow boards.
6. Shadow Vehicle 1 should be equipped with an arrow board and truck-mounted attenuator.
7. Shadow Vehicle 2 should be equipped with an arrow board. An appropriate lane closure sign should be placed on Shadow Vehicle 2 so as not to obscure the arrow board.
8. Shadow Vehicle 2 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.
9. The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.
10. Work should normally be accomplished during off-peak hours.
11. When the work vehicle occupies an interior lane (a lane other than the far right or far left) of a directional roadway having a right-hand shoulder 10 feet or more in width, Shadow Vehicle 2 should drive the right-hand shoulder with a sign indicating that work is taking place in the interior lane.

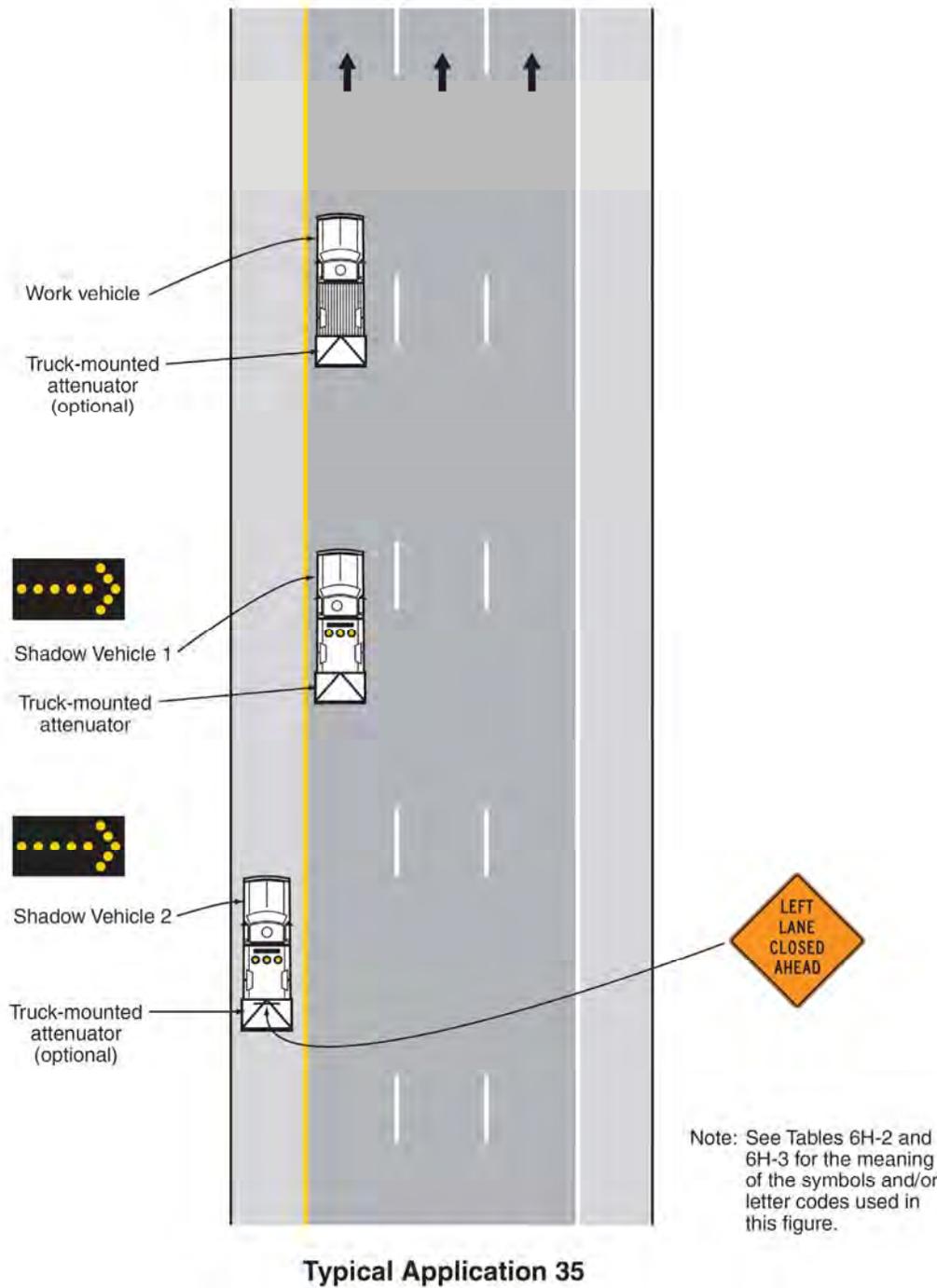
**Option:**

12. A truck-mounted attenuator may be used on Shadow Vehicle 2.
13. On high-speed roadways, a third shadow vehicle (not shown) may be used with Shadow Vehicle 1 in the closed lane, Shadow Vehicle 2 straddling the edge line, and Shadow Vehicle 3 on the shoulder.
14. Where adequate shoulder width is not available, Shadow Vehicle 3 may also straddle the edge line.

**Support:**

15. For state highways, see Department of Transportation's Standard Plan T15 and T16. See Section 1A.11 for information regarding this publication.

**Figure 6H-35. Mobile Operation on a Multi-Lane Road (TA-35)**



### Notes for Figure ~~6H-36~~ **6H-36(CA)** — Typical Application 36 Lane Shift on a Freeway

**Guidance:**

1. The lane shift should be used when the work space extends into either the right-hand or left-hand lane of a divided highway and it is not practical, for capacity reasons, to reduce the number of available lanes.

**Support:**

2. When a lane shift is accomplished by using
  - (1) geometry that meets the design speed at which the permanent highway was designed,
  - (2) full normal cross-section (full lane width and full shoulders), and
  - (3) complete pavement markings, then only the initial general work-zone warning sign is required.

**Guidance:**

3. When the conditions in Note 2 are not met, the information shown in the typical application should be employed and all the following notes apply.

**Standard:**

4. Temporary traffic barriers, if used, shall comply with the provisions of Section 6F.85.
5. The barrier shall not be placed along the shifting taper. The lane shall first be shifted using channelizing devices and pavement markings.

**Guidance:**

6. A warning sign should be used to show the changed alignment.

**Standard:**

7. ~~The number of lanes illustrated on the Reverse Curve signs shall be the same as the number of through lanes available to road users, and the direction of the reverse curves shall be appropriately illustrated.~~

**Option:**

8. Where two or more lanes are being shifted, a W1-4 (or W1-3) sign with an ALL LANES (W24-1cP) plaque (see Figure 6F-4) ~~may~~ **shall** be used instead of a sign that illustrates the number of lanes. **The Reverse Curve (W1-4) sign shall be used instead of the Reverse Curve (W1-4a & W1-4b) signs which shows the number of lanes.**

**Option:**

9. Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.

**Guidance:**

10. Where the shifted section is longer than 600 feet, one set of Reverse Curve signs should be used to show the initial shift and a second set should be used to show the return to the normal alignment. If the tangent distance along the temporary diversion is less than 600 feet, a Double Reverse Curve sign should be used instead of the first Reverse Curve sign, and the second Reverse Curve sign should be omitted. *Use the Reverse Curve (W1-4) signs for both locations instead of the Double Reverse Curve (W24-1) sign.*
11. If a STAY IN LANE sign is used, then solid white lane lines should be used.

**Standard:**

12. The minimum width of the shoulder lane shall be 10 feet.
13. For long-term stationary work, existing conflicting pavement markings shall be removed and temporary markings shall be installed before traffic patterns are changed.

**Option:**

14. For short-term stationary work, lanes may be delineated by channelizing devices or removable pavement markings instead of temporary markings.

**Guidance:**

15. If the shoulder cannot adequately accommodate trucks, trucks should be directed to use the travel lanes.
16. The use of a barrier should be based on engineering judgment.

**Option:**

17. Type C Steady-Burn warning lights may be placed on channelizing devices and the barrier parallel to the edge of the pavement for nighttime lane closures.

Option:

18. Detail 11 (see Figure 3A-102(CA)) may be used instead of the temporary solid white lane line, which is shown in Figure 6H-36(CA).

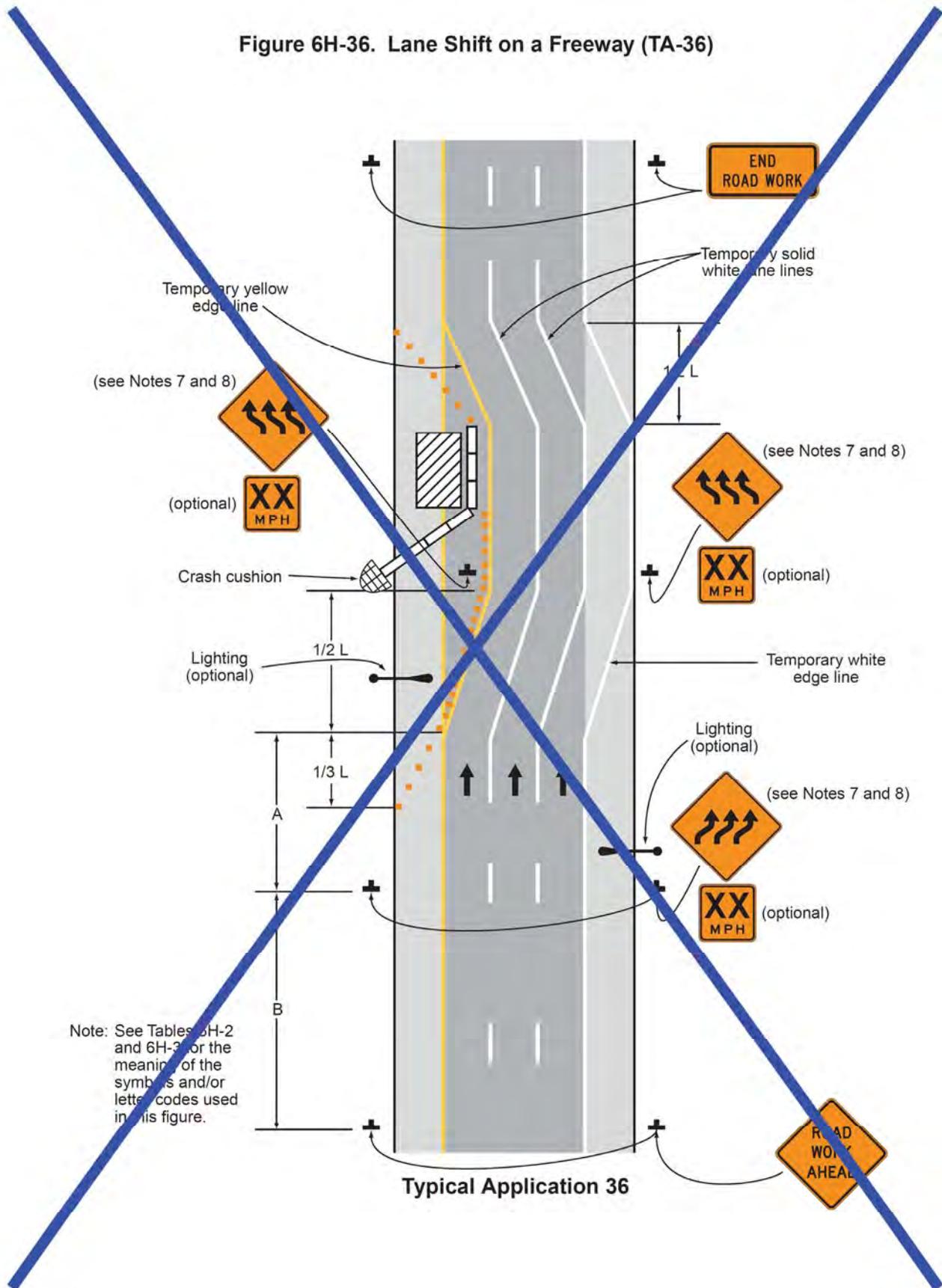
Support:

19. See Section 6F.106(CA) for use of the Slow For The Cone Zone (SC19(CA) and SC20(CA)) Signs.

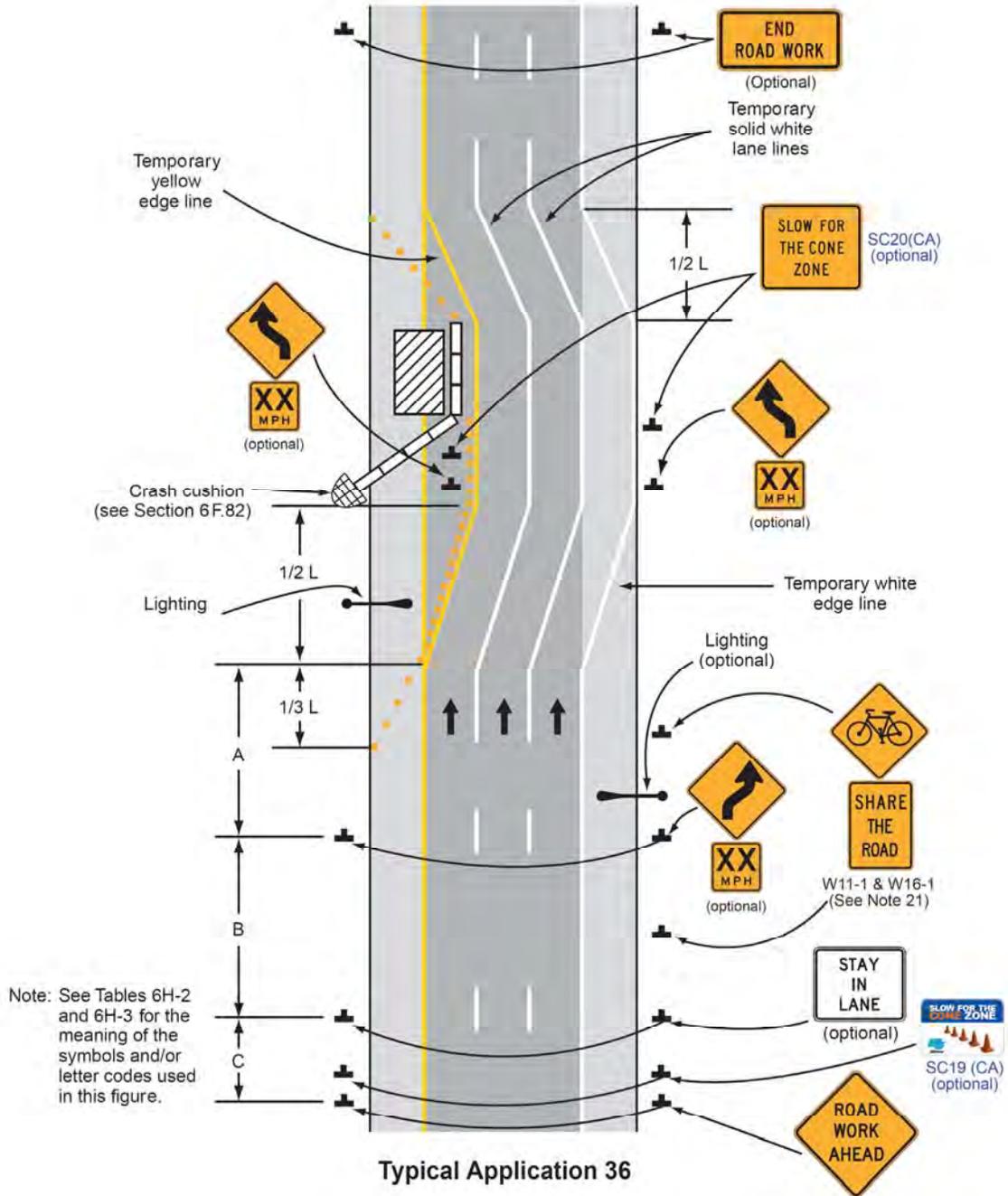
Guidance:

20. *All advance warning signs should be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.*
21. *When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (see Section 6G.02) and the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, the Bicycle Crossing (W11-1) sign and the SHARE THE ROAD (W16-1P) plaque should be used to advise motorists of the presence of bicyclists in the travel way lanes.*
22. *Except for short durations and mobile operations, when a highway shoulder is occupied and bicyclists would be sharing a lane with vehicular traffic, as a result of the TTC zone, speed reduction countermeasures should be used to reduce traffic speeds in the TTC zone. Refer to Sections 6C.01 and 6D.03.*
23. *Except for short durations and mobile operations, when a highway shoulder is occupied and bicyclists would be sharing a lane with vehicular traffic, as a result of the TTC zone, before narrowing the outside lane other measures such as widening the outside shoulder to allow bicyclists and motor vehicles to travel side by side through the TTC zone should be considered.*
24. *If traffic volumes make it feasible, the two left lanes should be merged into one lane to avoid using the shoulder as a traveled way lane and allowing continued use for emergency purposes and bicycle travel.*
25. *When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (see Section 6G.02) and the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, a separate path should be considered for bicyclists.*

**Figure 6H-36. Lane Shift on a Freeway (TA-36)**



**Figure 6H-36 (CA). Lane Shift on Freeway (TA-36)**



### Notes for Figure 6H-37—Typical Application 37 Double Lane Closure on a Freeway

**Standard:**

- 1. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

*Guidance:*

- 2. Ordinarily, the preferred position for the second arrow board is in the closed exterior lane at the upstream end of the second merging taper. However, the second arrow board should be placed in the closed interior lane at the downstream end of the second merging taper in the following situations:*
  - a. When a shadow vehicle is used in the interior closed lane, and the second arrow board is mounted on the shadow vehicle;*
  - b. If alignment or other conditions create any confusion as to which lane is closed by the second arrow board; and*
  - c. When the first arrow board is placed in the closed exterior lane at the downstream end of the first merging taper (the alternative position when the shoulder is narrow).*

**Option:**

3. Flashing warning lights and/or flags may be used to call attention to the initial warning signs.
4. A truck-mounted attenuator may be used on the shadow vehicle.
5. If a paved shoulder having a minimum width of 10 feet and sufficient strength is available, the left and adjacent interior lanes may be closed and vehicular traffic carried around the work space on the right-hand lane and a right-hand shoulder.

*Guidance:*

- 6. When a shoulder lane is used that cannot adequately accommodate trucks, trucks should be directed to use the normal travel lanes.*

**Standard:**

- 7. 3 cones or 2 Type II barricades shall be placed transversely across each closed lane at end of each merging taper and every 2000 feet throughout the lane closure.**
- 8. On freeways, maximum spacing of channelizing devices shall be 50 feet in advance warning and transition areas, 100 feet in activity and termination areas (see figure 6C-1).**

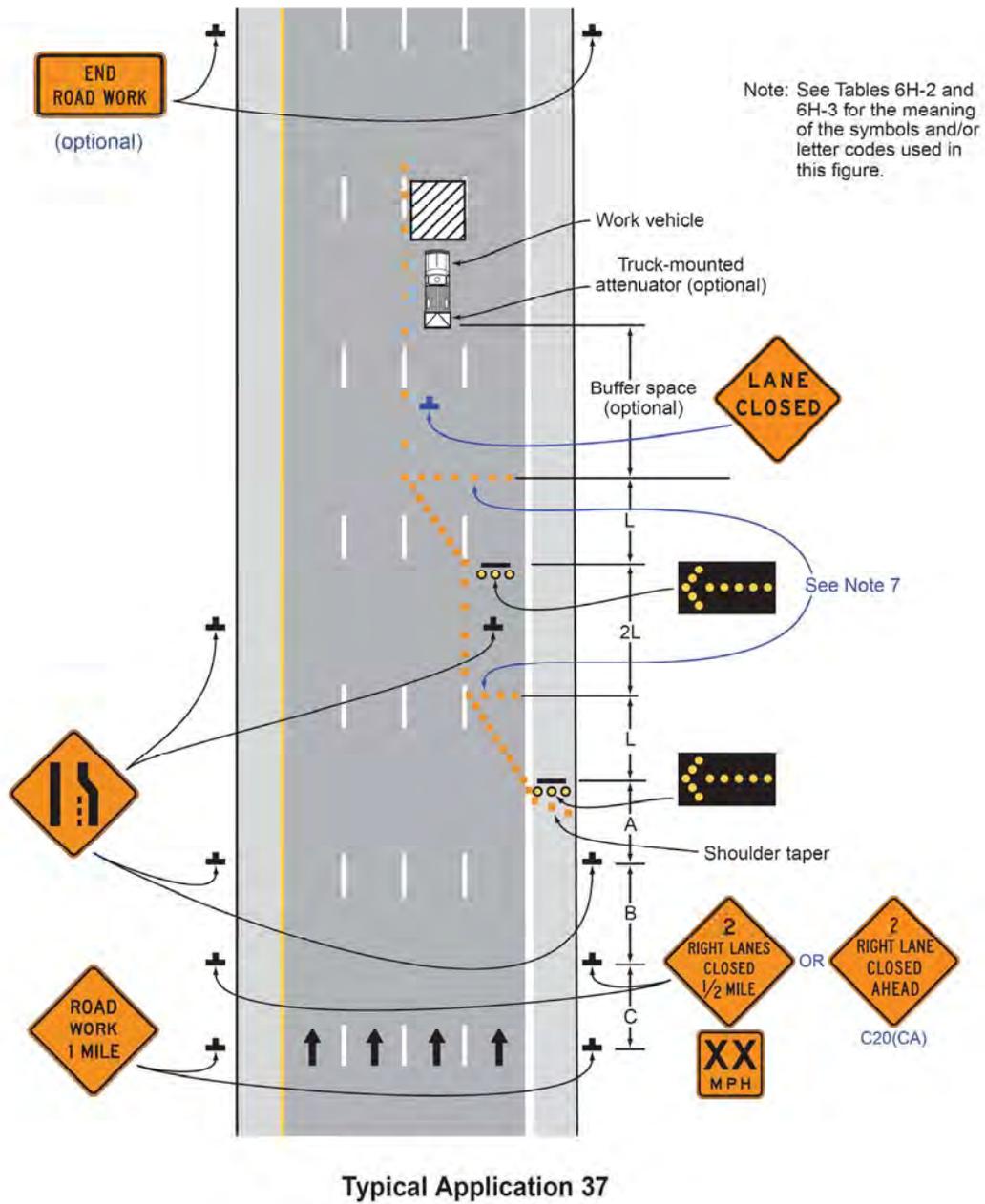
*Guidance:*

- 9. LANE CLOSED C30(CA) sign should be placed every 2000 feet throughout the lane closure adjacent to the open lane within the closed lane.*

**Support:**

10. For State highways, see Department of Transportation's Standard Plan T10. See Section 1A.11 for information regarding this publication.

**Figure 6H-37. Double Lane Closure on a Freeway (TA-37)**



### **Notes for Figure 6H-38—Typical Application 38 Interior Lane Closure on a Freeway**

**Standard:**

- ~~1. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.~~
- ~~2. If temporary traffic barriers are installed, they shall comply with the provisions and requirements in Section 6F.85.~~
- ~~3. The barrier shall not be placed along the shifting taper. The lane shall first be shifted using channelizing devices and pavement markings.~~
- ~~4. For long term stationary work, existing conflicting pavement markings shall be removed and temporary markings shall be installed before traffic patterns are changed.~~

*Guidance:*

- ~~5. For a long term closure, a barrier should be used to provide additional safety to the operation in the closed interior lane. A buffer space should be used at the upstream end of the closed interior lane.~~
- ~~6. The first arrow board displaying an arrow pointing to the right should be on the left hand shoulder at the beginning of the taper. The arrow board displaying a double arrow should be centered in the closed interior lane and placed at the downstream end of the shifting taper.~~
- ~~7. If the two arrow boards create confusion, the 2L distance between the end of the merging taper and beginning of the shift taper should be extended so that road users can focus on one arrow board at a time.~~
- ~~8. The placement of signs should not obstruct or obscure arrow boards.~~
- ~~9. For long term use, the dashed lane lines should be made solid white in the two lane section.~~

**Option:**

10. As an alternative to initially closing the left hand lane, as shown in the typical application, the right hand lane may be closed in advance of the interior lane closure with appropriate channelization and signs.
11. A short, single row of channelizing devices in advance of the vehicular traffic split to restrict vehicular traffic to their respective lanes may be added.
12. DO NOT PASS signs may be used.
13. If a paved shoulder having a minimum width of 10 feet and sufficient strength is available, the left hand and center lanes may be closed and motor vehicle traffic carried around the work space on the right hand lane and a right hand shoulder.

*Guidance:*

- ~~14. When a shoulder lane is used that cannot adequately accommodate trucks, trucks should be directed to use the normal travel lanes.~~

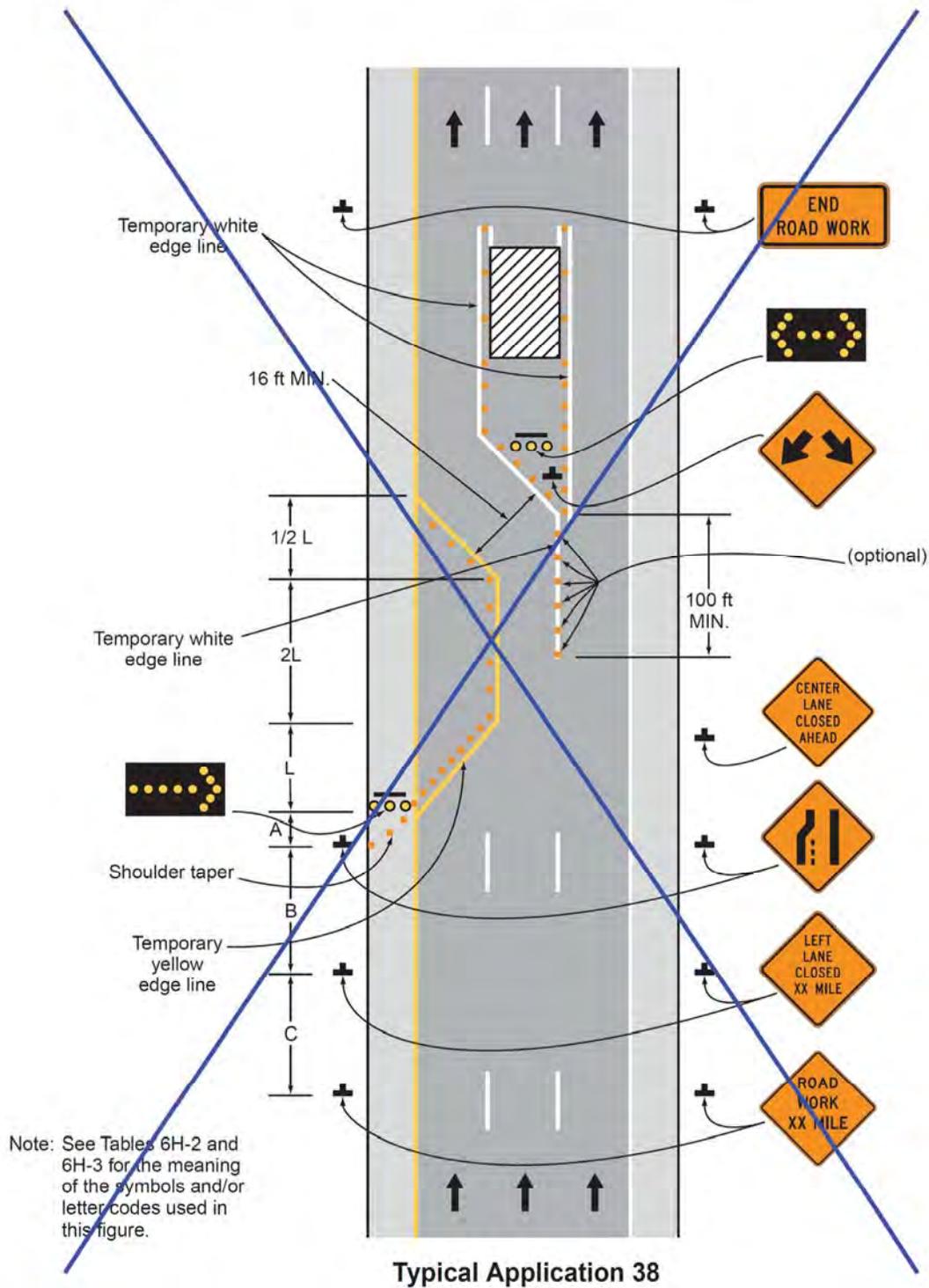
**Standard:**

This typical application is deleted for application and shall not be used on freeways in California. Whenever an interior lane needs to be closed on freeways, all adjacent lane(s) to one side of this lane shall be closed as illustrated in Figure 6H-37.

**Support:**

For state highways, see Department of Transportation's Standard Plan T10, T10A and T14. For interior lane closure on Freeways using mobile operation, see Department of Transportation's Standard Plan T16. See Section 1A.11 for information regarding this publication.

**Figure 6H-38. Interior Lane Closure on a Freeway (TA-38)**



### Notes for Figure 6H-39—Typical Application 39 Median Crossover on a Freeway

**Standard:**

- 1. Channelizing devices or temporary traffic barriers shall be used to separate opposing vehicular traffic.**
- 2. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

*Guidance:*

- 3. For long-term work on high-speed, high-volume highways, consideration should be given to using a temporary traffic barrier to separate opposing vehicular traffic.*

*Option:*

4. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic, Do Not Pass, KEEP RIGHT, and DO NOT ENTER signs may be eliminated.
5. The alignment of the crossover may be designed as a reverse curve.

*Guidance:*

- 6. When the crossover follows a curved alignment, the design criteria contained in the AASHTO "Policy on the Geometric Design of Highways and Streets" (see Section 1A.11) should be used.*
- 7. When channelizing devices have the potential of leading vehicular traffic out of the intended traffic space, the channelizing devices should be extended a distance in feet of 2.0 times the speed limit in mph beyond the downstream end of the transition area as depicted.*
- 8. Where channelizing devices are used, the Two-Way Traffic signs should be repeated every 1 mile.*

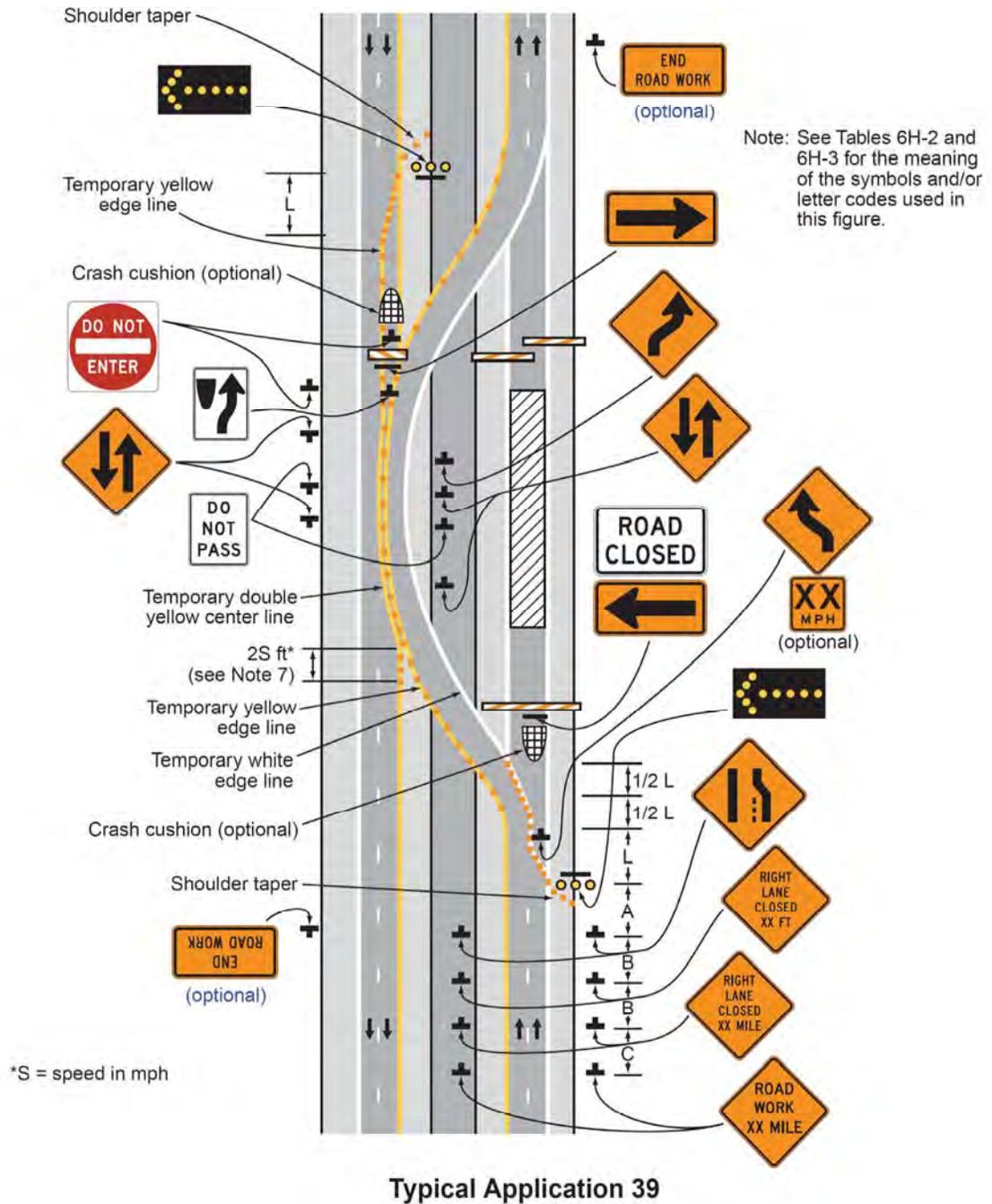
*Option:*

9. NEXT XX MILES Supplemental Distance plaques may be used with the Two-Way Traffic signs, where XX is the distance to the downstream end of the two-way section.

*Support:*

10. When the distance is sufficiently short that road users entering the section can see the downstream end of the section, they are less likely to forget that there is opposing vehicular traffic.
11. The sign legends for the four pairs of signs approaching the lane closure for the non-crossover direction of travel are not shown. They are similar to the series shown for the crossover direction, except that the left lane is closed.

**Figure 6H-39. Median Crossover on a Freeway (TA-39)**



### **Notes for Figure 6H-40—Typical Application 40 Median Crossover for an Entrance Ramp**

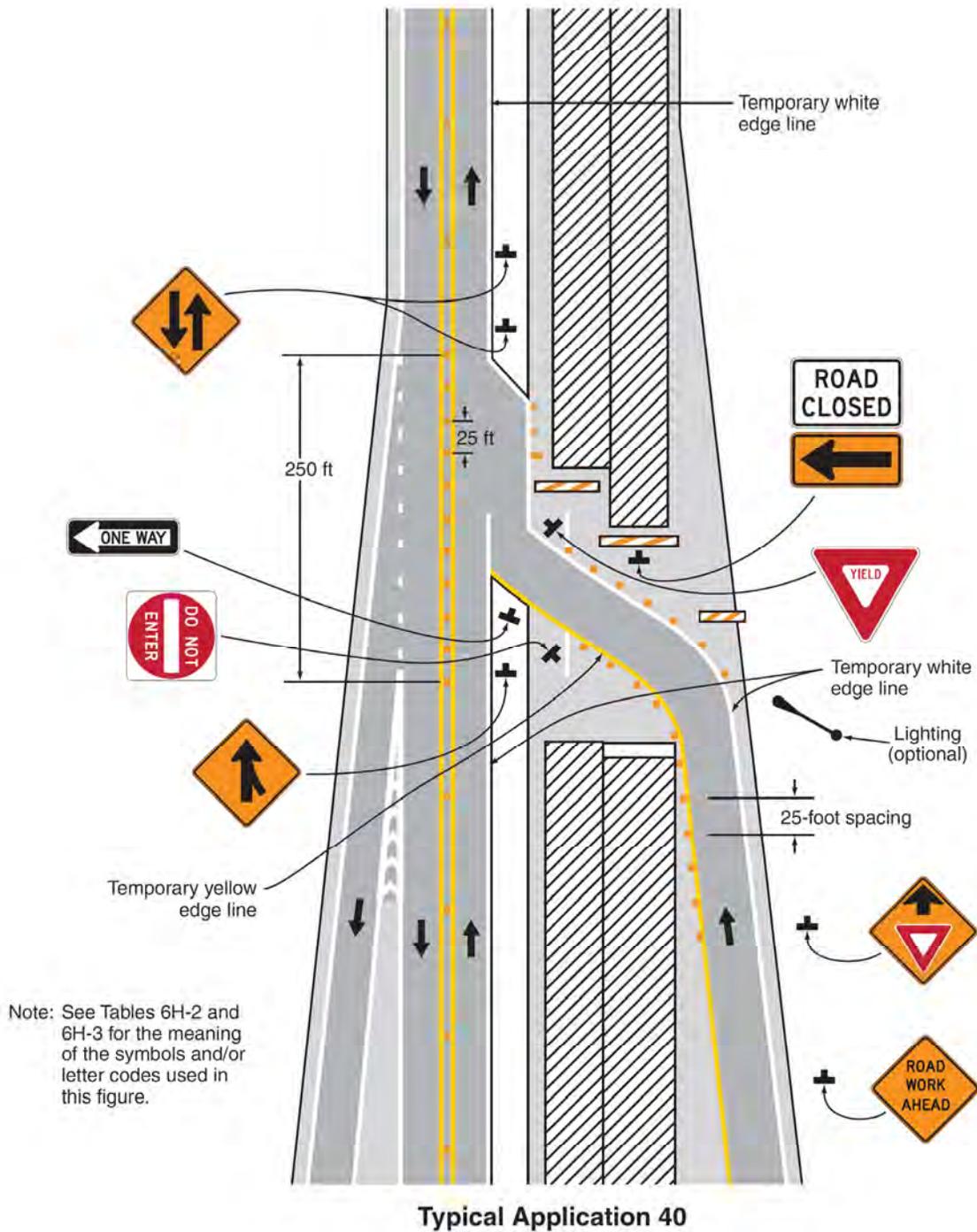
*Guidance:*

- 1. The typical application illustrated should be used for carrying an entrance ramp across a closed directional roadway of a divided highway.*
- 2. A temporary acceleration lane should be used to facilitate merging.*
- 3. When used, the YIELD or STOP sign should be located far enough forward to provide adequate sight distance of oncoming mainline vehicular traffic to select an acceptable gap, but should not be located so far forward that motorists will be encouraged to stop in the path of the mainline traffic. If needed, yield or stop lines should be installed across the ramp to indicate the point at which road users should yield or stop. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed.*

*Option:*

- 4. If vehicular traffic conditions allow, the ramp may be closed.*
- 5. A broken edge line may be carried across the temporary entrance ramp to assist in defining the through vehicular traffic lane.*
- 6. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs and the DO NOT ENTER signs may be eliminated.*

**Figure 6H-40. Median Crossover for an Entrance Ramp (TA-40)**



### **Notes for Figure 6H-41—Typical Application 41 Median Crossover for an Exit Ramp**

*Guidance:*

- 1. This typical application should be used for carrying an exit ramp across a closed directional roadway of a divided highway. The design criteria contained in the AASHTO "Policy on the Geometric Design of Highways and Streets" (see Section 1A.11) should be used for determining the curved alignment.*
- 2. The guide signs should indicate that the ramp is open, and where the temporary ramp is located. Conversely, if the ramp is closed, guide signs should indicate that the ramp is closed.*
- 3. When the exit is closed, a black on orange EXIT CLOSED sign panel should be placed diagonally across the interchange/intersection guide signs and channelizing devices should be placed to physically close the ramp.*
- 4. In the situation (not shown) where channelizing devices are placed along the mainline roadway, the devices' spacing should be reduced in the vicinity of the off ramp to emphasize the opening at the ramp itself. Channelizing devices and/or temporary pavement markings should be placed on both sides of the temporary ramp where it crosses the median and the closed roadway.*
- 5. Advance guide signs providing information related to the temporary exit should be relocated or duplicated adjacent to the temporary roadway.*

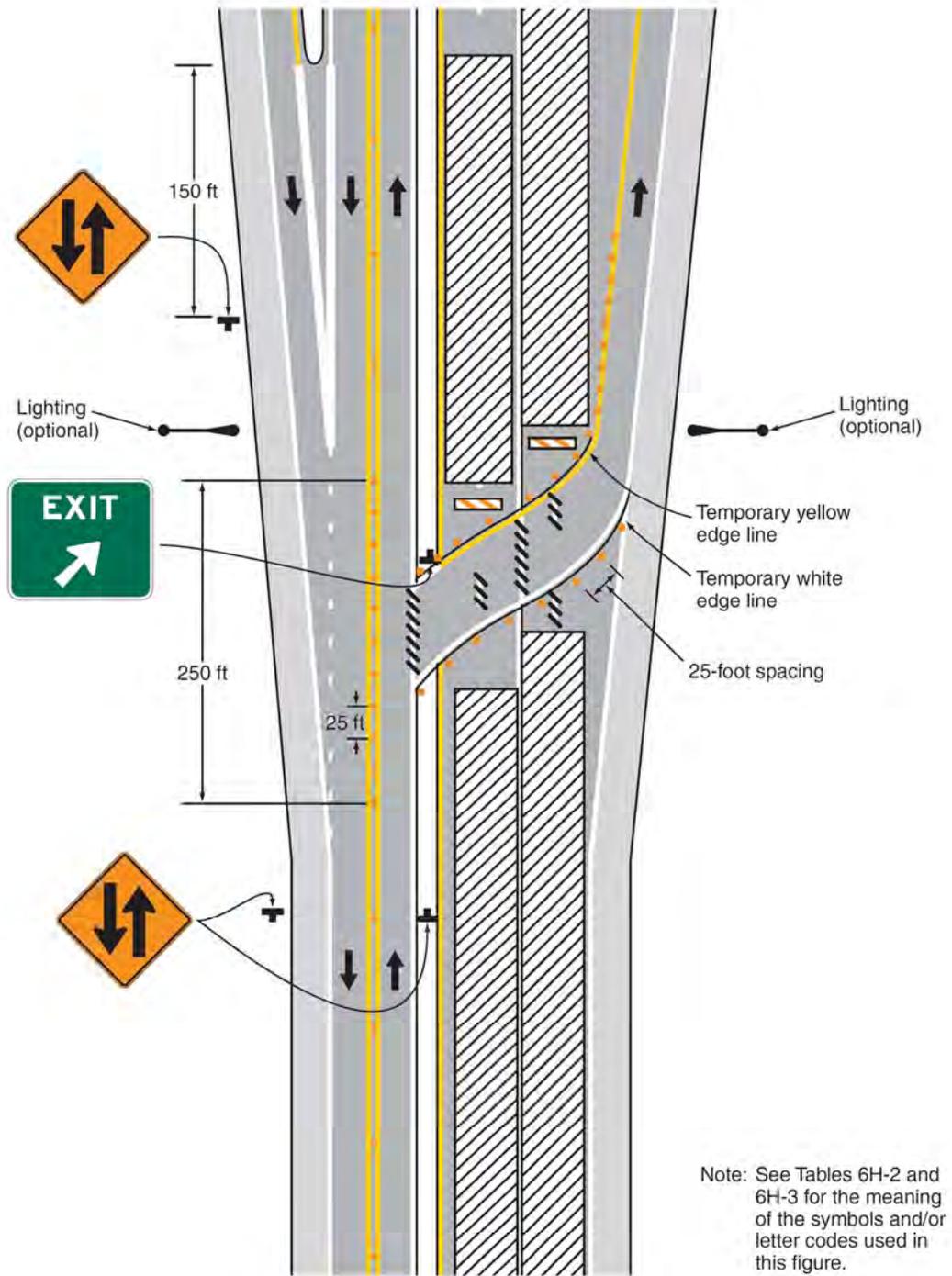
**Standard:**

- 6. A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 7 feet from the pavement surface to the bottom of the sign.**

*Option:*

- 7. Guide signs referring to the exit may need to be relocated to the median.*
- 8. The temporary EXIT sign placed in the temporary gore may be either black on orange or white on green.*
- 9. In some instances, a temporary deceleration lane may be useful in facilitating the exiting maneuver.*
- 10. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs may be omitted.*

Figure 6H-41. Median Crossover for an Exit Ramp (TA-41)



Typical Application 41

### Notes for Figure 6H-42—Typical Application 42 Work in the Vicinity of an Exit Ramp

*Guidance:*

- 1. The guide signs should indicate that the ramp is open, and where the temporary ramp is located. However, if the ramp is closed, guide signs should indicate that the ramp is closed.*
- 2. When the exit ramp is closed, a black on orange EXIT CLOSED sign panel should be placed diagonally across the interchange/intersection guide signs.*
- 3. The design criteria contained in the AASHTO "Policy on the Geometric Design of Highways and Streets" (see Section 1A.11) should be used for determining the alignment.*

**Standard:**

- 4. A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 7 feet from the pavement surface to the bottom of the sign.**

*Option:*

- 5. The temporary EXIT sign placed in the temporary gore may be either black on orange or white on green.*
- 6. An alternative procedure that may be used is to channelize exiting vehicular traffic onto the right-hand shoulder and close the lane as necessary.*

**Standard:**

- 7. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

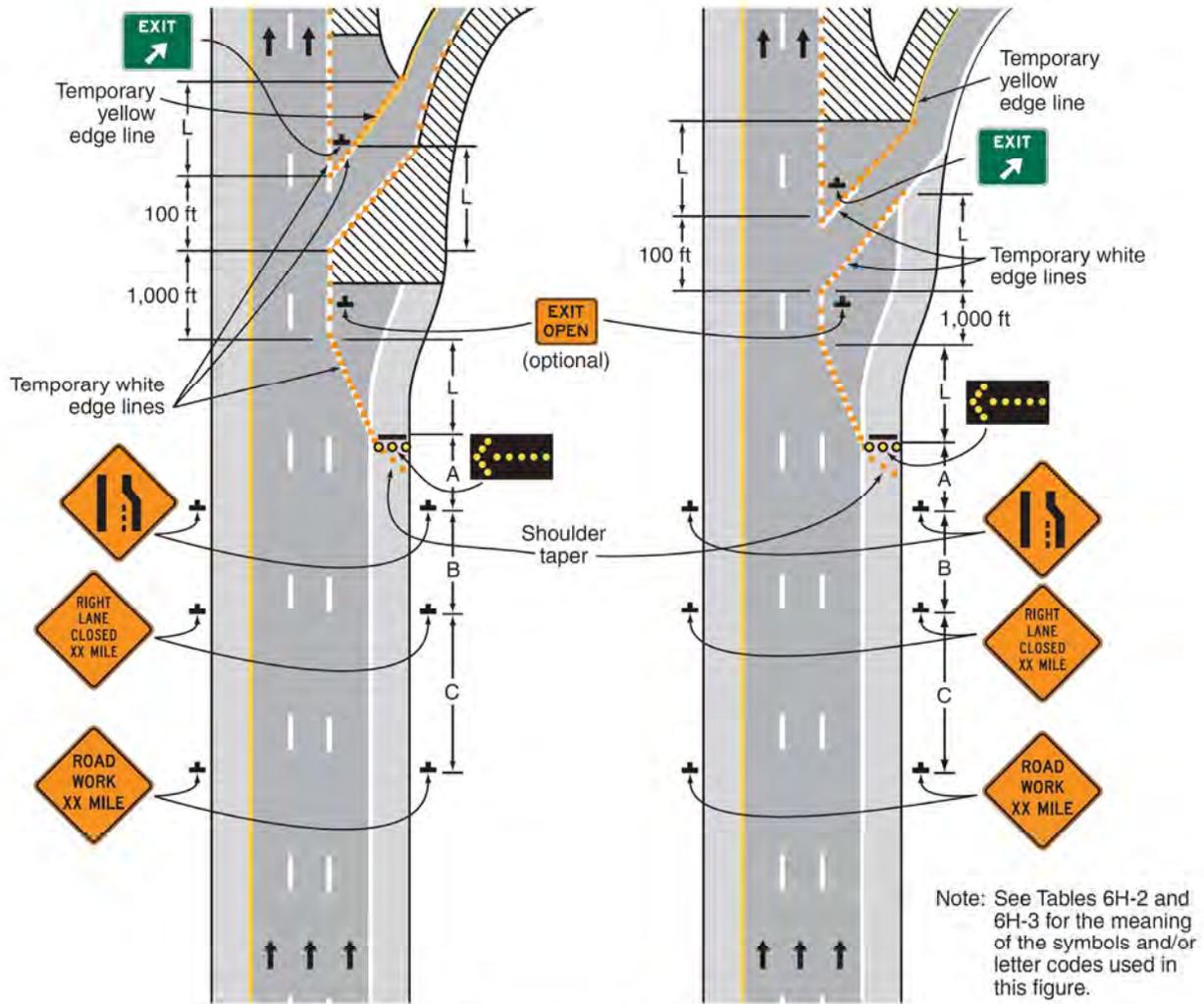
*Option:*

The Department of Transportation's Standard Plan T10, T10A and T14 may be used instead of this typical application.

*Support:*

See Section 1A.11 for information regarding this publication.

**Figure 6H-42. Work in the Vicinity of an Exit Ramp (TA-42)**



**Typical Application 42**

### Notes for Figure 6H-43—Typical Application 43 Partial Exit Ramp Closure

*Guidance:*

1. *Truck off-tracking should be considered when determining whether the minimum lane width of 10 feet is adequate (see Section 6G.08).*

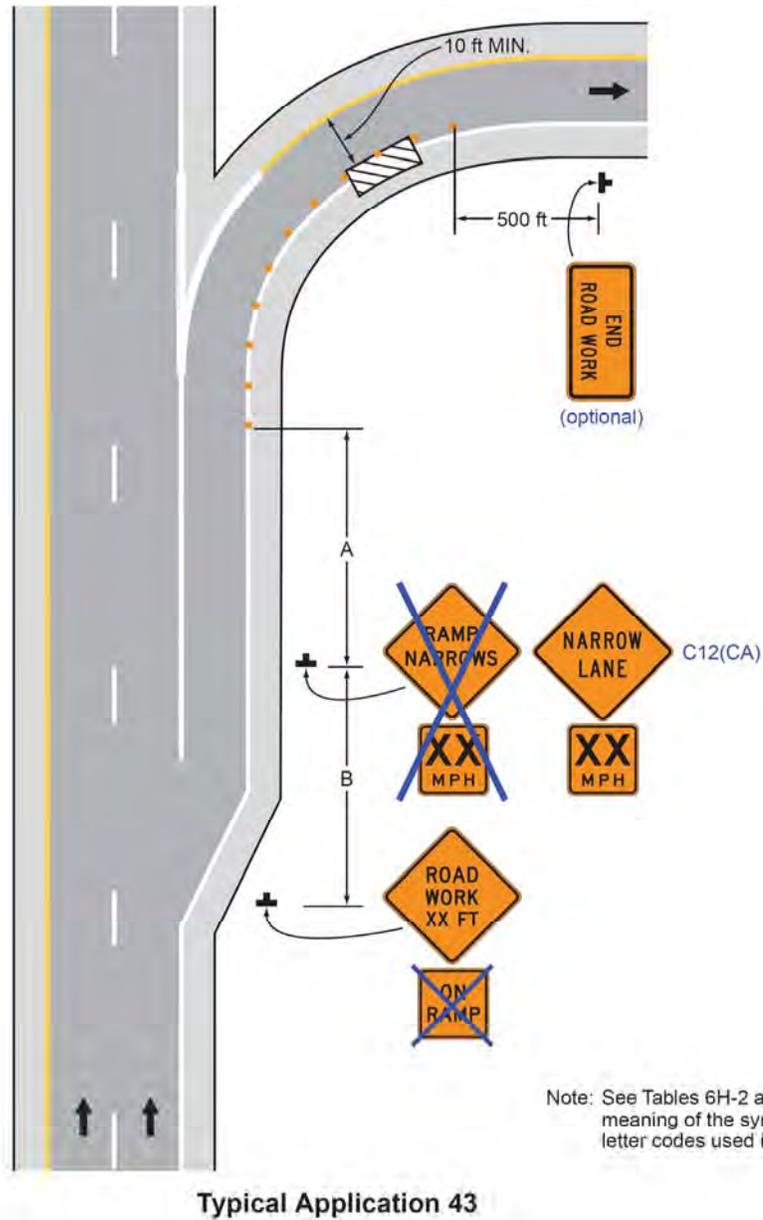
**Standard:**

2. **The RAMP NARROWS (W5-4) sign and ON RAMP (W13-4P) plaque shall not be used in California. The ROAD NARROWS (W5-1) sign or NARROW LANE(S) (C12(CA)) sign, as appropriate, shall be used instead. See Sections 2C.19 and 6F.102(CA).**

*Guidance:*

3. *For planned partial ramp closure, consideration should be given to closing the entire exit ramp. Refer to Department of Transportation's Standard Plan T14. See Section 1A.11 for information regarding this publication.*

Figure 6H-43. Partial Exit Ramp Closure (TA-43)



### Notes for Figure 6H-44—Typical Application 44 Work in the Vicinity of an Entrance Ramp

*Guidance:*

1. An acceleration lane of sufficient length should be provided whenever possible as shown on the left diagram.

**Standard:**

2. For the information shown on the diagram on the right-hand side of the typical application, where inadequate acceleration distance exists for the temporary entrance, the YIELD sign shall be replaced with STOP signs (one on each side of the approach).

*Guidance:*

3. When used, the YIELD or STOP sign should be located so that ramp vehicular traffic has adequate sight distance of oncoming mainline vehicular traffic to select an acceptable gap in the mainline vehicular traffic flow, but should not be located so far forward that motorists will be encouraged to stop in the path of the mainline traffic. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed. If insufficient gaps are available, consideration should be given to closing the ramp.
4. Where STOP signs are used, a temporary stop line should be placed across the ramp at the desired stop location.
5. The mainline merging taper with the arrow board at its starting point should be located sufficiently in advance so that the arrow board is not confusing to drivers on the entrance ramp, and so that the mainline merging vehicular traffic from the lane closure has the opportunity to stabilize before encountering the vehicular traffic merging from the ramp.
6. If the ramp curves sharply to the right, warning signs with advisory speeds located in advance of the entrance terminal should be placed in pairs (one on each side of the ramp).

**Option:**

7. A Stop Beacon (see Section 4L.05) or a Type B high-intensity warning flasher with a red lens may be placed above the STOP sign.
8. Where the acceleration distance is significantly reduced, a supplemental plaque may be placed below the Yield Ahead sign reading NO MERGE AREA.

**Standard:**

9. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.

**Option:**

The Department of Transportation's Standard Plan T10, T10A and T14 may be used instead of this typical application.

**Support:**

See Section 1A.11 for information regarding this publication.



## Notes for Figure 6H-45—Typical Application 45 Temporary Reversible Lane Using Movable Barriers

### Support:

1. This application addresses one of several uses for movable barriers (see Section 6F.85) in highway work zones. In this example, one side of a 6-lane divided highway is closed to perform the work operation, and vehicular traffic is carried in both directions on the remaining 3-lane roadway by means of a median crossover.  
To accommodate unbalanced peak-period vehicular traffic volumes, the direction of travel in the center lane is switched to the direction having the greater volume, with the transfer typically being made twice daily. Thus, there are four vehicular traffic phases described as follows:
  - a. Phase A—two travel lanes northbound and one lane southbound;
  - b. Transition A to B—one travel lane in each direction;
  - c. Phase B—one travel lane northbound and two lanes southbound; and
  - d. Transition B to A—one travel lane in each direction.The typical application on the left illustrates the placement of devices during Phase A. The typical application on the right shows conditions during the transition (Transition A to B) from Phase A to Phase B.

### Guidance:

2. *For the reversible-lane situation depicted, the ends of the movable barrier should terminate in a protected area or a crash cushion should be provided. During Phase A, the transfer vehicle should be parked behind the downstream end of the movable barrier for southbound traffic as shown in the typical application on the left. During Phase B, the transfer vehicle should be parked behind between the downstream ends of the movable barriers at the north end of the TTC zone as shown in the typical application on the right. The transition shift from Phase A to B should be as follows:*
  - a. *Change the signs in the northbound advance warning area and transition area from a LEFT LANE CLOSED AHEAD to a 2 LEFT LANES CLOSED AHEAD. Change the mode of the second northbound arrow board from Caution to Right Arrow.*
  - b. *Place channelizing devices to close the northbound center lane.*
  - c. *Move the transfer vehicle from south to north to shift the movable barrier from the west side to the east side of the reversible lane.*
  - d. *Remove the channelizing devices closing the southbound center lane.*
  - e. *Change the signs in the southbound transition area and advance warning area from a 2 LEFT LANES CLOSED AHEAD to a LEFT LANE CLOSED AHEAD. Change the mode of the second southbound arrow board from Right Arrow to Caution.*
3. *Where the lane to be opened and closed is an exterior lane (adjacent to the edge of the traveled way or the work space), the lane closure should begin by closing the lane with channelizing devices placed along a merging taper using the same information employed for a stationary lane closure. The lane closure should then be extended with the movable-barrier transfer vehicle moving with vehicular traffic. When opening the lane, the transfer vehicle should travel against vehicular traffic. The merging taper should be removed in a method similar to a stationary lane closure.*

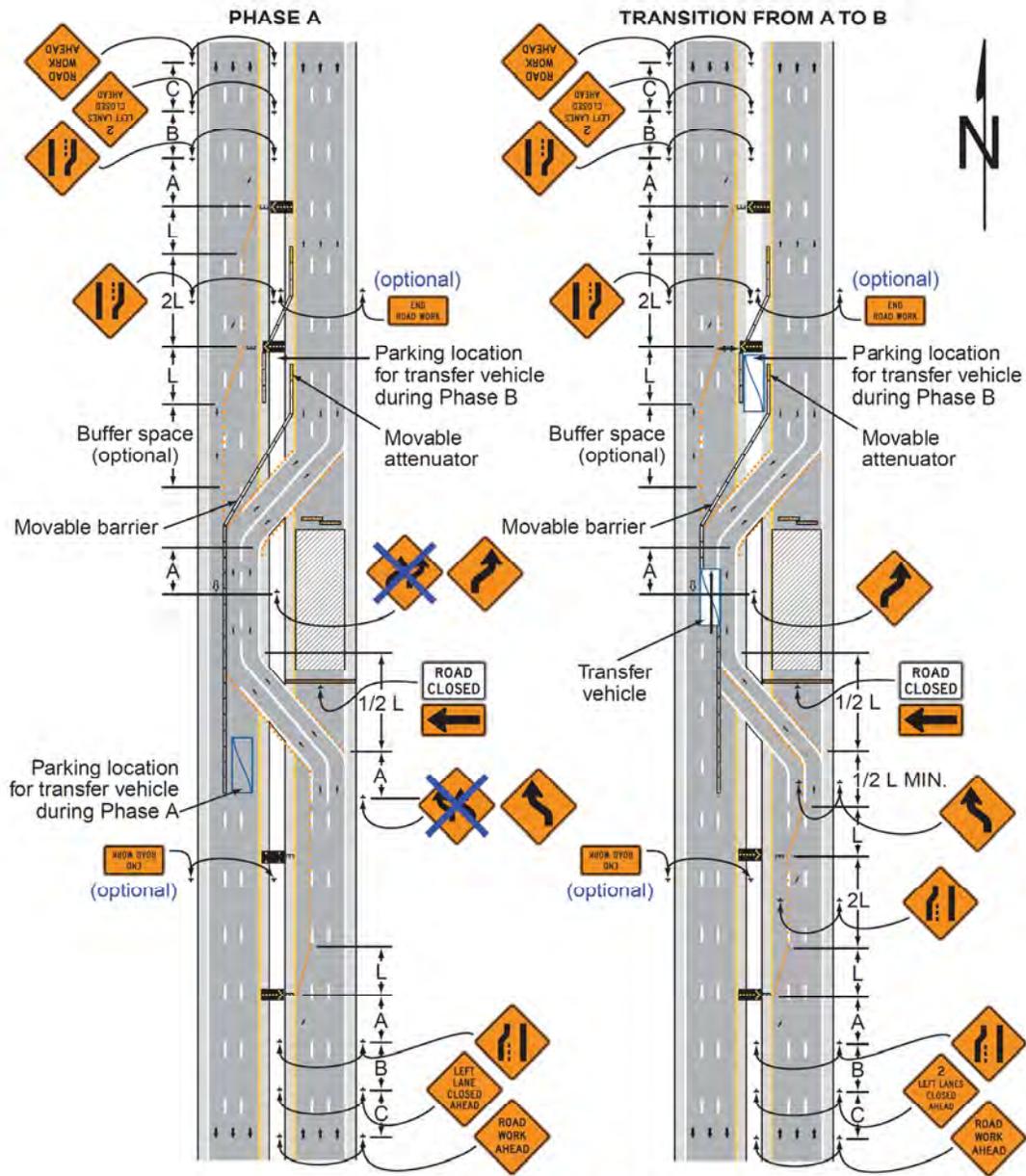
### Option:

4. The procedure may be used during a peak period of vehicular traffic and then changed to provide two lanes in the other direction for the other peak.
5. A longitudinal buffer space may be used in the activity area to separate opposing vehicular traffic.
6. A work vehicle or a shadow vehicle may be equipped with a truck-mounted attenuator.

### Standard:

7. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

**Figure 6H-45. Temporary Reversible Lane Using Movable Barriers (TA-45)**



**Typical Application 45**

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure. Although leader lines point to the signs on the right-hand side of the roadway, most of these signs should be installed on both sides of the roadway.

### Notes for Figure 6H-46—Typical Application 46 Work in the Vicinity of a Grade Crossing

*Guidance:*

1. *When grade crossings exist either within or in the vicinity of roadway work activities, extra care should be taken to minimize the probability of conditions being created, by lane restrictions, flagging, or other operations, where vehicles might be stopped within the grade crossing, considered as being 15 feet on either side of the closest and farthest rail. This should include roadway work activities on a street parallel to a highway-rail grade crossing where right-hand turns or left-hand turns could be impacted.*

**Standard:**

2. **If the queuing of vehicles across active rail tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the grade crossing to prevent through or turning vehicles from stopping within the grade crossing (as described in Note 1), even if automatic warning devices are in place.**

*Guidance:*

3. *Early coordination with the railroad company or light rail transit agency should occur before work starts.*
4. *In the example depicted, the buffer space of the activity area should be extended upstream of the grade crossing (as shown) so that a queue created by the flagging operation will not extend across the grade crossing.*
5. *The DO NOT STOP ON TRACKS sign should be used on all approaches to a grade crossing within the limits of a TTC zone.*

*Option:*

6. *Flashing warning lights and/or flags may be used to call attention to the advance warning signs.*
7. *A BE PREPARED TO STOP sign may be added to the sign series.*

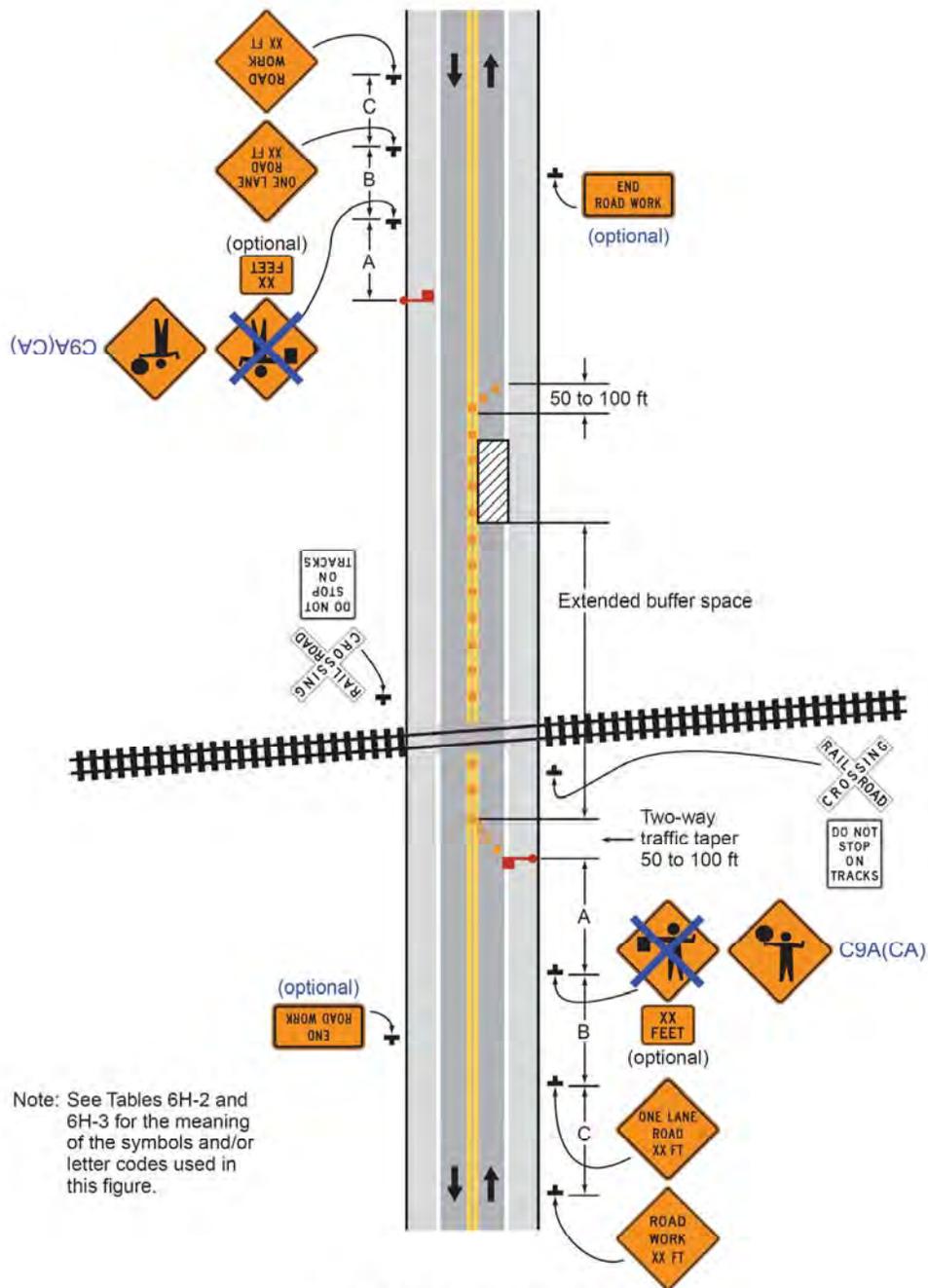
*Guidance:*

8. *When used, the BE PREPARED TO STOP sign should be located ~~before~~ after the Flagger symbol sign.*

**Standard:**

9. **At night, flagger stations shall be illuminated, except in emergencies.**

Figure 6H-46. Work in the Vicinity of a Grade Crossing (TA-46)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 46

## Notes for Figure 6H-101CA) – Typical Application 101(CA) Shoulder Closure on Urban (Low Speed) Locations to Accommodate Bicyclists

### Guidance:

1. When existing accommodations for bicycle travel are disrupted or closed, information and devices contained in Figures 6H-101(CA) through 6H-104(CA), as appropriate per situation encountered, should be used to consider the needs and control of bicyclists through a TTC zone.
2. **SHOULDER CLOSED** signs should be used on limited-access roadways where there is no opportunity for disabled vehicles to pull off the roadway.
3. If drivers cannot see a pull-off area beyond the closed shoulder, information regarding the length of the shoulder closure should be provided in feet or miles, as appropriate.
4. The use of a temporary traffic barrier should be based on engineering judgment.

### Standard:

5. **Temporary traffic barriers, including their end treatments, shall be crashworthy. In order to mitigate the effect of striking the upstream end of a temporary traffic barrier, the end shall be installed in accordance with AASHTO's "Roadside Design Guide" (see Section 1A.11) by flaring until the end is outside the acceptable clear zone or by providing crashworthy end treatments. See Section 6F.85 for more details.**

### Option:

6. The barrier shown in this typical application is an example of one method that may be used to close a shoulder of a long-term project.
7. The warning lights shown on the barrier may be used.

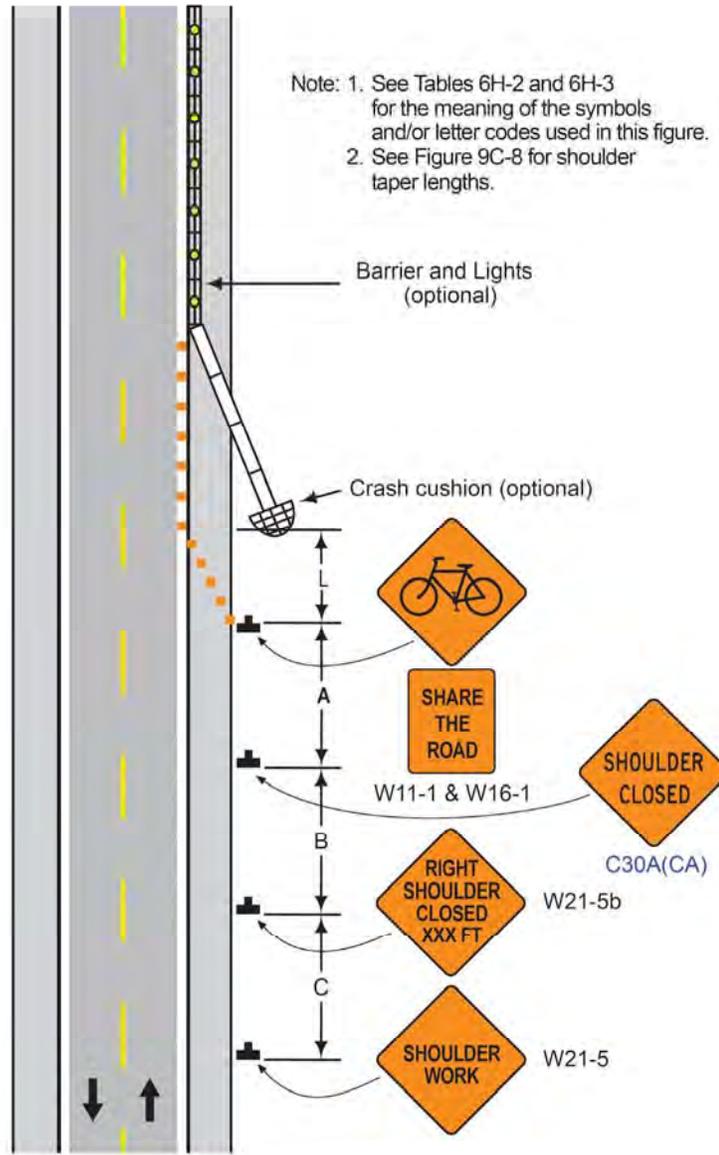
### Standard:

8. **The minimum offset from the upstream end of the barrier to the edge of the traveled way shall be at least 15 feet unless shielded by a crash cushion.**

### Guidance:

9. This typical application should only be used in urban areas where posted speed is 25 mph or less. For applications on roadway with a posted speed of 30 mph or more use typical application TA-102(CA).
10. All advance warning signs should be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.
11. Where feasible, an adequate lane width should be provided to allow bicyclists and motor vehicles to travel side by side throughout the TTC zone. If lane width conditions are not met, use the **SHARE THE ROAD** or **Bicycles May Use Full Lane** sign.
12. The speeds used for the shoulder taper calculations should be of bicyclists in the project vicinity or if a special event such as a bike race, the expected speed of bicyclists approaching the TTC zone.

**Figure 6H-101 (CA). Shoulder Closure on Urban (Low Speed) locations to accommodate bicyclists (TA-101 (CA))**



Typical Application 101 (CA)

### **Notes for Figure 6H-102(CA) – Typical Application 102(CA) Lane Closure on Freeway, Expressway, Rural and Urban (High Speed) Locations to Accommodate Bicyclists**

*Guidance:*

1. *When existing accommodations for bicycle travel are disrupted or closed, information and devices contained in Figures 6H-101(CA) through 6H-104(CA), as appropriate per situation encountered, should be used to consider the needs and control of bicyclists through a TTC zone.*
2. *SHOULDER CLOSED signs should be used on limited-access highways where there is no opportunity for disabled vehicles to pull off the roadway.*
3. *If drivers cannot see a pull-off area beyond the closed shoulder, information regarding the length of the shoulder closure should be provided in feet or miles, as appropriate.*
4. *The use of a temporary traffic barrier should be based on engineering judgment.*

**Standard:**

5. **Temporary traffic barriers, including their end treatments, shall be crashworthy. In order to mitigate the effect of striking the upstream end of a temporary traffic barrier, the end shall be installed in accordance with AASHTO's "Roadside Design Guide" (see Section 1A.11) by flaring until the end is outside the acceptable clear zone or by providing crashworthy end treatments. See Section 6F.85 for more details.**

*Option:*

6. *The barrier shown in this typical application is an example of one method that may be used to close a shoulder of a long-term project.*
7. *The warning lights shown on the barrier may be used.*

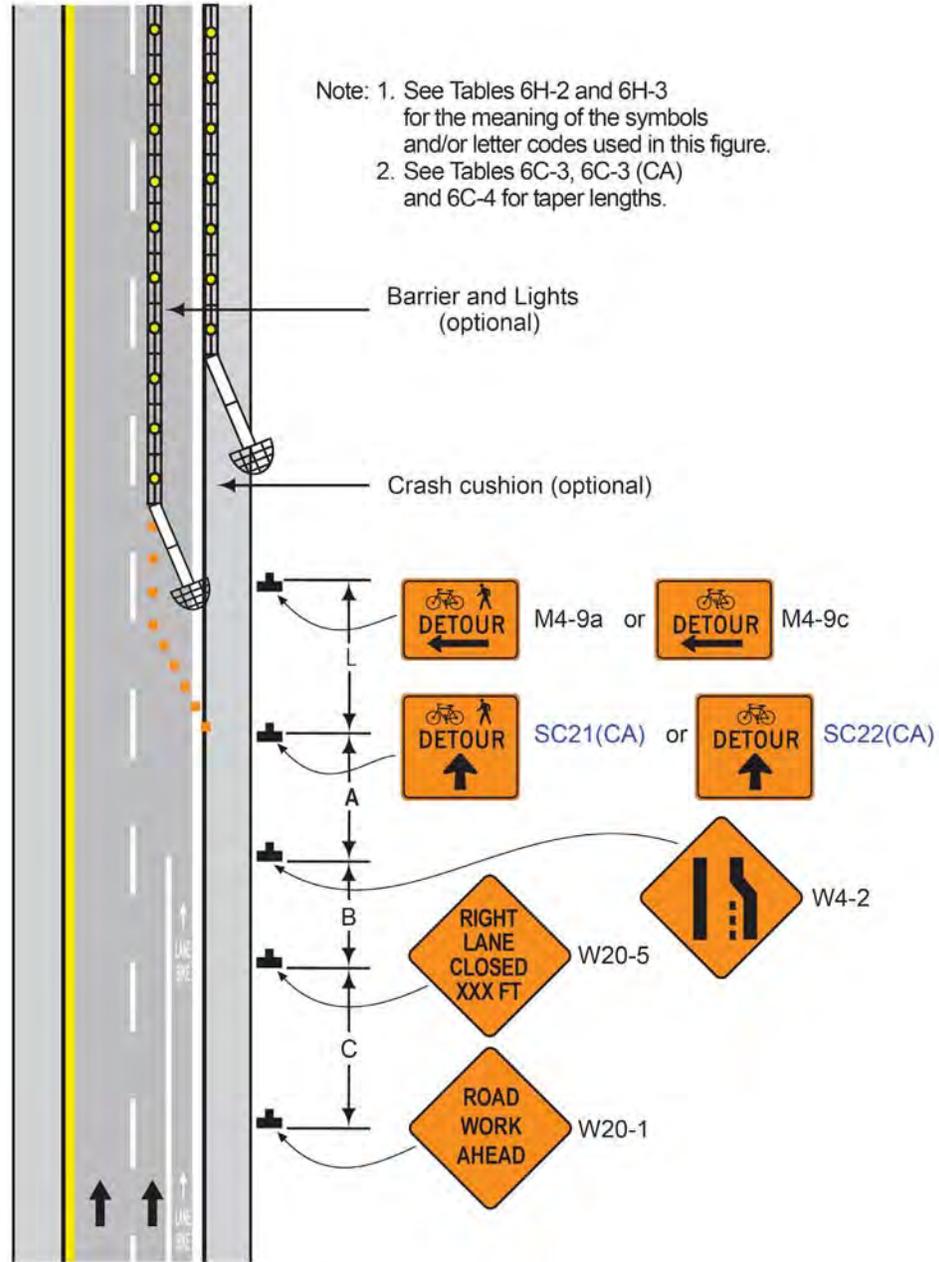
**Standard:**

8. **The minimum offset from the upstream end of the barrier to the edge of the traveled way shall be at least 15 feet unless shielded by a crash cushion.**

*Guidance:*

9. *All advance warning signs should be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.*
10. *The width of the existing pedestrian facility should be provided for the temporary facility, if practical. When it is not possible to maintain a minimum width of 60 inch throughout the entire length of the pedestrian pathway, a 60 x 60 inch passing space should be provided at least every 200 feet to allow individuals in wheelchairs to pass.*

**Figure 6H-102 (CA). Lane Closure on Freeway, Expressway, Rural and Urban (High Speed) locations to accommodate bicyclists (TA-102 (CA))**



**Typical Application 102 (CA)**

### Notes for Figure 6H-103(CA)—Typical Application 103(CA) Detour for Bike Lane on Roads with Closure of One Travel Direction

**Guidance:**

1. When existing accommodations for bicycle travel are disrupted or closed, information and devices contained in Figures 6H-101(CA) through 6H-104(CA), as appropriate per situation encountered, should be used to consider the needs and control of bicyclists through a TTC zone.
2. This plan should be used for streets without posted route numbers.
3. On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.

**Option:**

4. The STREET CLOSED legend may be used in place of ROAD CLOSED.
5. Additional DO NOT ENTER signs may be used at intersections with intervening streets.
6. Warning lights may be used on Type III Barricades.
7. Detour signs may be located on the far side of intersections.
8. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

**Standard:**

9. When used, the Street Name sign shall be placed above the Detour sign.

**Guidance:**

10. The DETOUR (M4-8) sign should be placed on tangent sections at intervals not to exceed 1300 feet and at major intersections.

**Option:**

11. In urban areas, the M4-8 signs may be placed at every intersection.

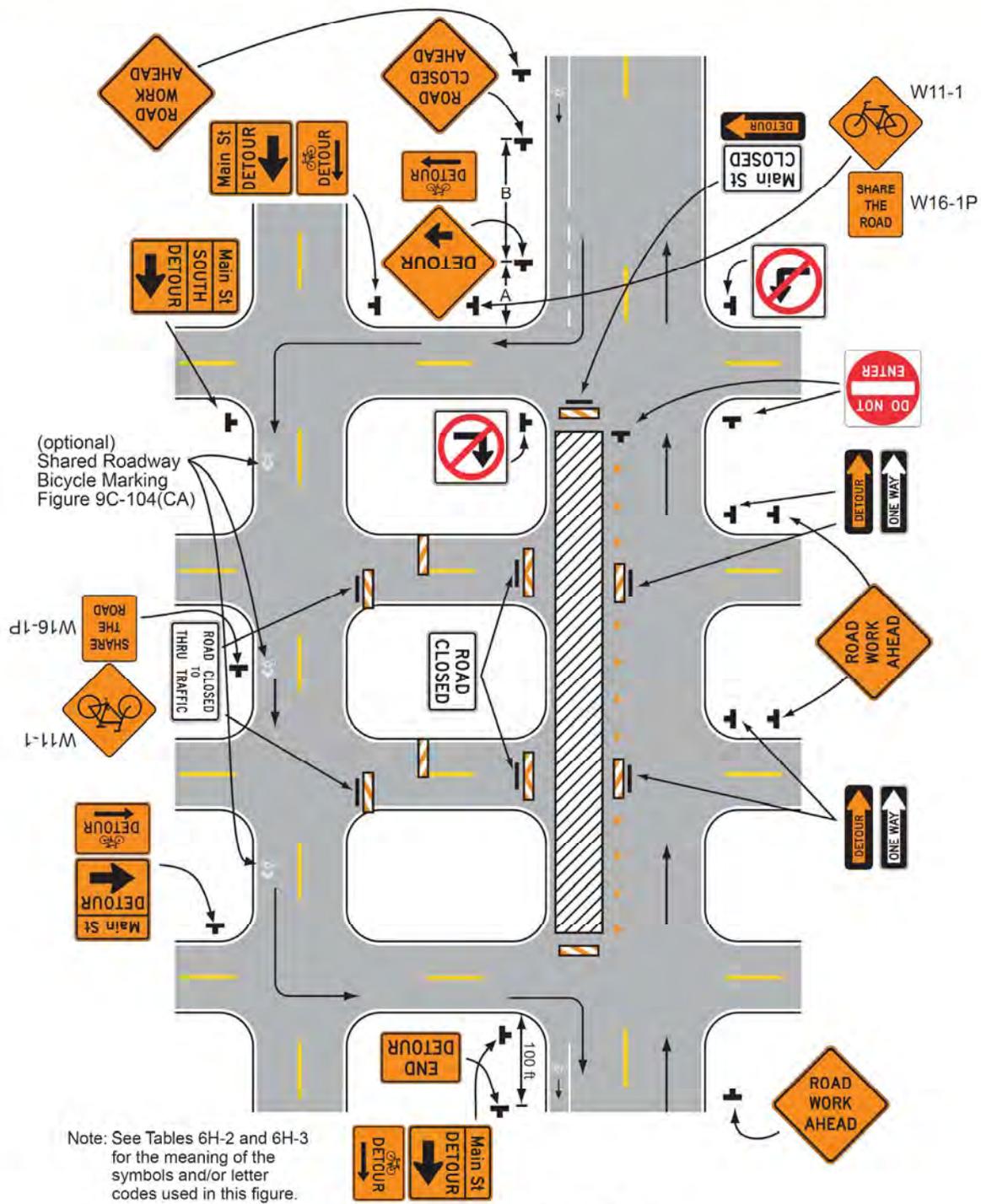
**Guidance:**

12. When the detour is applicable to bicyclists and not pedestrians, the Bicycle Detour (M4-9c) sign should be used instead of the Pedestrian/Bicycle Detour (M4-9a) sign.
13. All advance warning signs should be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.

**Option:**

14. For long-term duration projects (see Section 6G.02), the shared roadway bicycle marking may be used along detours with on-street parking and inadequate lane width.

**Figure 6H-103 (CA). Detour for Bike Lane on Roads with Closure of One Travel Direction (TA-103 (CA))**



**Typical Application 103 (CA)**

### Notes for Figure 6H-104(CA)—Typical Application 104(CA) Right Lane and Bike Lane Closure on Far Side of Intersection

*Guidance:*

- 1. When existing accommodations for bicycle travel are disrupted or closed, information and devices contained in Figures 6H-101(CA) through 6H-104(CA), as appropriate per situation encountered, should be used to consider the needs and control of bicyclists through a TTC zone.*
- 2. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.*

*Option:*

- 3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right lane having significant right turning movements, then the right lane may be restricted to right turns only, as shown. This procedure increases the through capacity by eliminating right turns from the open through lane.*
- 4. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.*
- 5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.*
- 6. Where the turning radius is large, it may be possible to create a right-turn island using channelizing devices or pavement markings.*

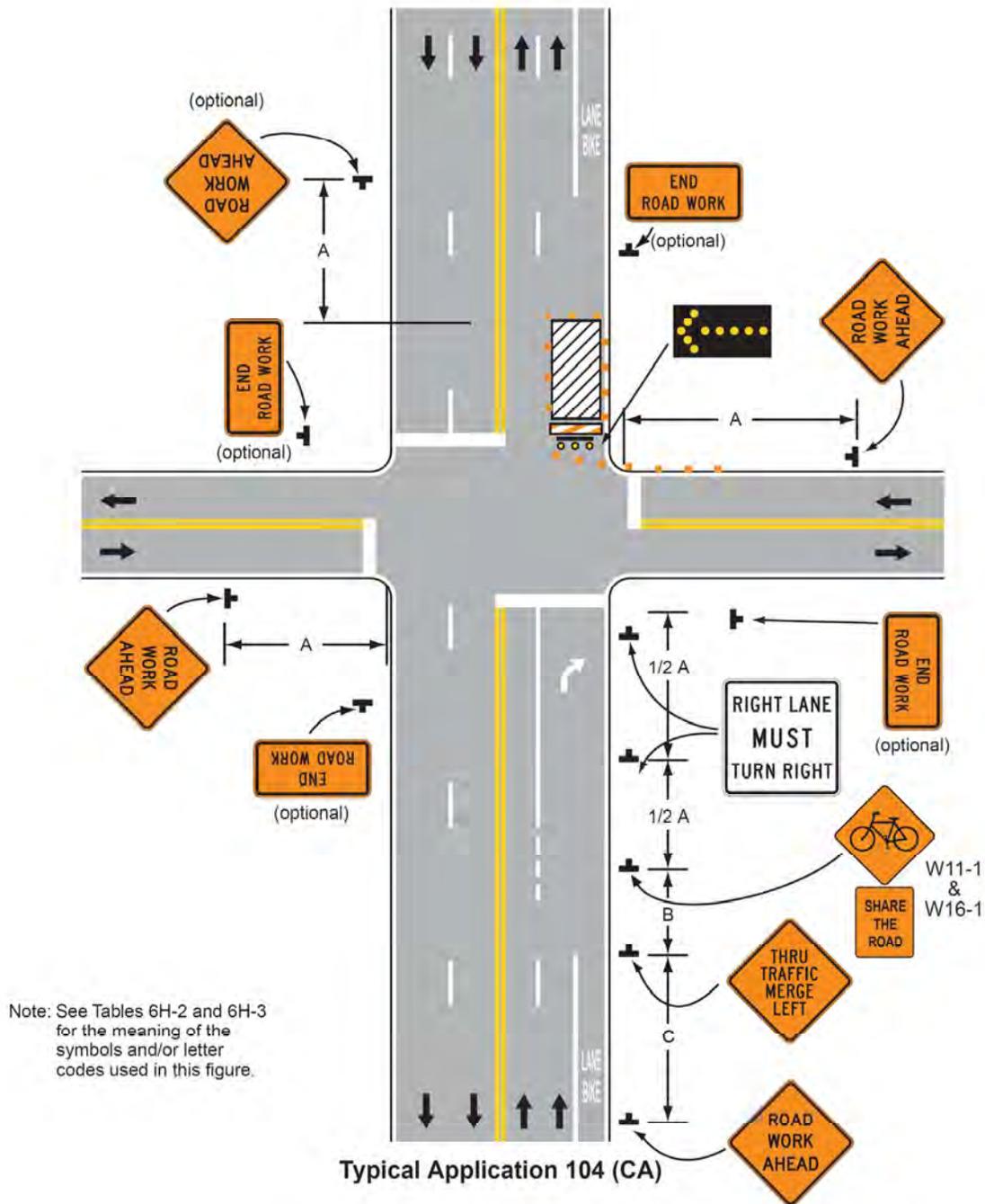
*Guidance:*

- 7. All advance warning signs should be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.*
- 8. For long-term duration projects (see Section 6G.02), consideration should be given to installing signs in an overhead location.*

*Option:*

- 9. A high-level warning device (flag tree) may supplement the advance warning signs. Refer to Section 6F.62.*

**Figure 6H-104 (CA). Right Lane and Bike Lane Closure on Far Side of Intersection (TA-104 (CA))**



### Notes for Figure 6H-105(CA)—Typical Application 105(CA) Lane Shift on Road with Low Traffic Volumes

**Guidance:**

1. *The lanes on either side of the center work space should have a minimum width of 10 feet as measured from the near edge of the channelizing devices to the edge of pavement or the outside edge of paved shoulder.*
2. *All advance warning signs should be placed so that the path of travel for bicycles is not blocked while maintaining visibility for road users.*

**Standard:**

3. **Workers in the roadway shall wear high-visibility safety apparel as described in Section 6D.03.**

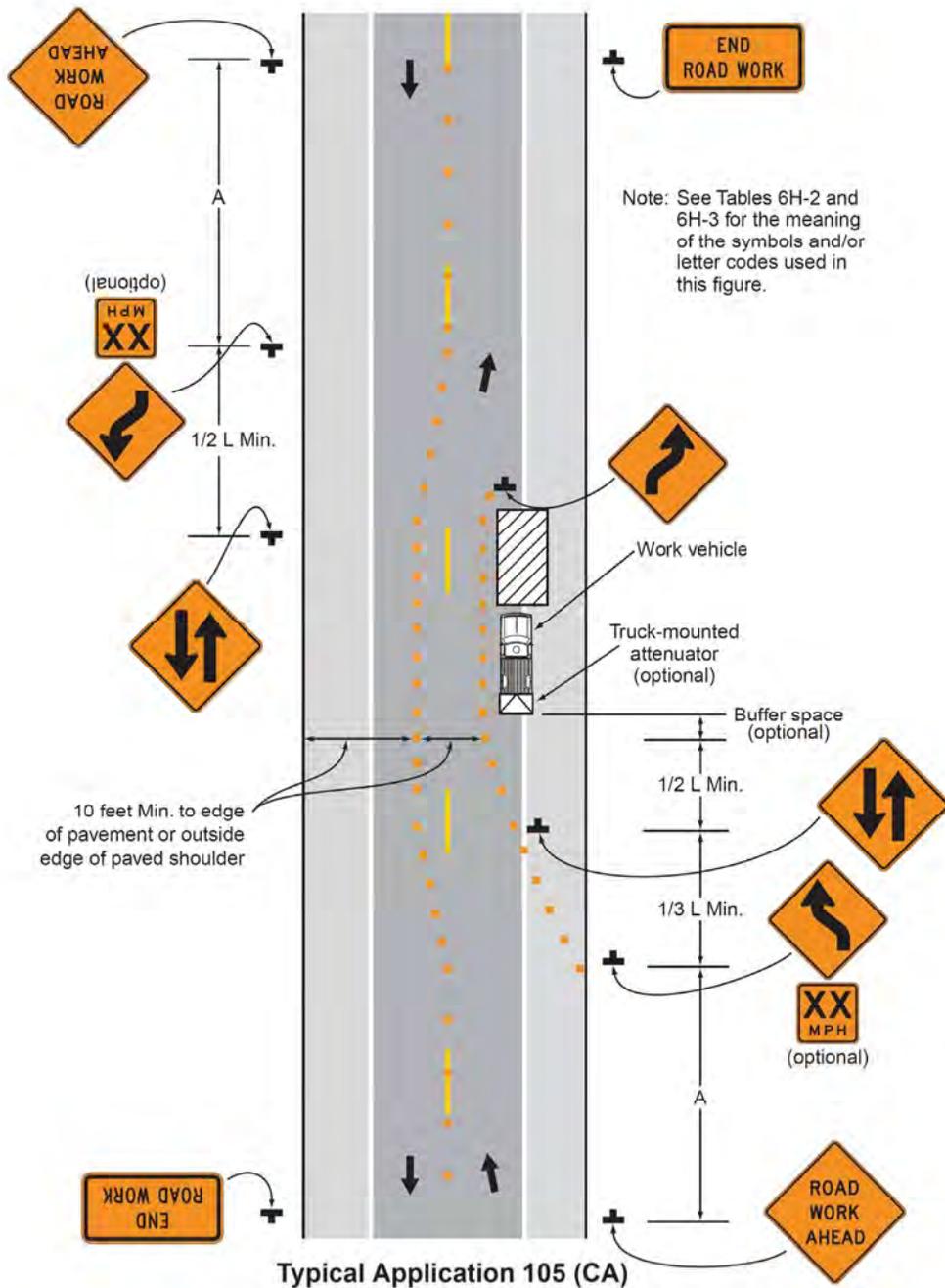
**Option:**

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. If the closure continues overnight, warning lights may be used on the channelizing devices.
6. A lane width of 9 feet may be used for short-term stationary work on low-volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.
7. A work vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights may be used instead of the channelizing devices forming the tapers or the high-level warning devices.
8. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

**Standard:**

9. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
10. **Notes 6 and 7 shall not be applicable for State highways. Note #1 shall be used instead for State highways**

**Figure 6H-105 (CA). Lane Shift on Road With Low Traffic Volumes (TA-105 (CA))**





## CHAPTER 6I. CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS

### Section 6I.01 General

#### Support:

01 The National Incident Management System (NIMS) requires the use of the Incident Command System (ICS) at traffic incident management scenes.

02 A traffic incident is an emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic.

03 A traffic incident management area is an area of a highway where temporary traffic controls are installed, as authorized by a public authority or the official having jurisdiction of the roadway, in response to a road user incident, natural disaster, hazardous material spill, or other unplanned incident. It is a type of TTC zone and extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where vehicles return to the original lane alignment and are clear of the incident.

04 Traffic incidents can be divided into three general classes of duration, each of which has unique traffic control characteristics and needs. These classes are:

- A. Major—expected duration of more than 2 hours,
- B. Intermediate—expected duration of 30 minutes to 2 hours, and
- C. Minor—expected duration under 30 minutes.

05 The primary functions of TTC at a traffic incident management area are to inform road users of the incident and to provide guidance information on the path to follow through the incident area. Alerting road users and establishing a well defined path to guide road users through the incident area will serve to protect the incident responders and those involved in working at the incident scene and will aid in moving road users expeditiously past or around the traffic incident, will reduce the likelihood of secondary traffic crashes, and will preclude unnecessary use of the surrounding local road system. Examples include a stalled vehicle blocking a lane, a traffic crash blocking the traveled way, a hazardous material spill along a highway, and natural disasters such as floods and severe storm damage.

#### Guidance:

06 *In order to reduce response time for traffic incidents, highway agencies, appropriate public safety agencies (law enforcement, fire and rescue, emergency communications, emergency medical, and other emergency management), and private sector responders (towing and recovery and hazardous materials contractors) should mutually plan for occurrences of traffic incidents along the major and heavily traveled highway and street system.*

07 *On-scene responder organizations should train their personnel in TTC practices for accomplishing their tasks in and near traffic and in the requirements for traffic incident management contained in this Manual. On-scene responders should take measures to move the incident off the traveled roadway or to provide for appropriate warning. All on-scene responders and news media personnel should constantly be aware of their visibility to oncoming traffic and wear high-visibility apparel. See Section 6D.03 for details on high-visibility apparel requirements.*

08 *Emergency vehicles should be safe-positioned (see definition in Section 1A.13) such that traffic flow through the incident scene is optimized. All emergency vehicles that subsequently arrive should be positioned in a manner that does not interfere with the established temporary traffic flow.*

09 *Responders arriving at a traffic incident should estimate the magnitude of the traffic incident, the expected time duration of the traffic incident, and the expected vehicle queue length, and then should set up the appropriate temporary traffic controls for these estimates.*

#### Option:

10 Warning and guide signs used for TTC traffic incident management situations may have a black legend and border on a fluorescent pink background (see Figure 6I-1).

**Support:**

<sup>10a</sup> Signs used for regular TTC (black legend and boarder on orange or fluorescent orange background) are also acceptable. Truck or trailer mounted Portable Changeable Message (PCMS) signs are effective tools for traffic incident management.

<sup>11</sup> While some traffic incidents might be anticipated and planned for, emergencies and disasters might pose more severe and unpredictable problems. The ability to quickly install proper temporary traffic controls might greatly reduce the effects of an incident, such as secondary crashes or excessive traffic delays. An essential part of fire, rescue, spill clean-up, highway agency, and enforcement activities is the proper control of road users through the traffic incident management area in order to protect responders, victims, and other personnel at the site. These operations might need corroborating legislative authority for the implementation and enforcement of appropriate road user regulations, parking controls, and speed zoning. It is desirable for these statutes to provide sufficient flexibility in the authority for, and implementation of, TTC to respond to the needs of changing conditions found in traffic incident management areas.

**Option:**

<sup>12</sup> For traffic incidents, particularly those of an emergency nature, TTC devices on hand may be used for the initial response as long as they do not themselves create unnecessary additional hazards.

## **Section 6I.02 Major Traffic Incidents**

**Support:**

<sup>01</sup> Major traffic incidents are typically traffic incidents involving hazardous materials, fatal traffic crashes involving numerous vehicles, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility for a period exceeding 2 hours.

**Guidance:**

<sup>02</sup> *If the traffic incident is anticipated to last more than 24 hours, applicable procedures and devices set forth in other Chapters of Part 6 should be used.*

**Support:**

<sup>03</sup> A road closure can be caused by a traffic incident such as a road user crash that blocks the traveled way. Road users are usually diverted through lane shifts or detoured around the traffic incident and back to the original roadway. A combination of traffic engineering and enforcement preparations is needed to determine the detour route, and to install, maintain or operate, and then to remove the necessary traffic control devices when the detour is terminated. Large trucks are a significant concern in such a detour, especially when detouring them from a controlled-access roadway onto local or arterial streets.

<sup>04</sup> During traffic incidents, large trucks might need to follow a route separate from that of automobiles because of bridge, weight, clearance, or geometric restrictions. Also, vehicles carrying hazardous material might need to follow a different route from other vehicles.

<sup>05</sup> Some traffic incidents such as hazardous material spills might require closure of an entire highway. Through road users must have adequate guidance around the traffic incident. Maintaining good public relations is desirable. The cooperation of the news media in publicizing the existence of, and reasons for, traffic incident management areas and their TTC can be of great assistance in keeping road users and the general public well informed.

<sup>06</sup> The establishment, maintenance, and prompt removal of lane diversions can be effectively managed by interagency planning that includes representatives of highway and public safety agencies.

**Guidance:**

<sup>07</sup> *All traffic control devices needed to set up the TTC at a traffic incident should be available so that they can be readily deployed for all major traffic incidents. The TTC should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert traffic approaching the queue and to encourage early diversion to an appropriate alternative route.*

<sup>08</sup> *Attention should be paid to the upstream end of the traffic queue such that warning is given to road users approaching the back of the queue.*

<sup>09</sup> *If manual traffic control is needed, it should be provided by qualified flaggers or uniformed law enforcement officers.*

**Option:**

<sup>10</sup> If flaggers are used to provide traffic control for an incident management situation, the flaggers may use appropriate traffic control devices that are readily available or that can be brought to the traffic incident scene on short notice.

**Guidance:**

<sup>11</sup> *When light sticks or flares are used to establish the initial traffic control at incident scenes, channelizing devices (see Section 6F.63) should be installed as soon thereafter as practical.*

**Option:**

<sup>12</sup> The light sticks or flares may remain in place if they are being used to supplement the channelizing devices.

**Guidance:**

<sup>13</sup> *The light sticks, flares, and channelizing devices should be removed after the incident is terminated.*

### **Section 6I.03 Intermediate Traffic Incidents**

**Support:**

<sup>01</sup> Intermediate traffic incidents typically affect travel lanes for a time period of 30 minutes to 2 hours, and usually require traffic control on the scene to divert road users past the blockage. Full roadway closures might be needed for short periods during traffic incident clearance to allow traffic incident responders to accomplish their tasks.

<sup>02</sup> The establishment, maintenance, and prompt removal of lane diversions can be effectively managed by interagency planning that includes representatives of highway and public safety agencies.

**Guidance:**

<sup>03</sup> *All traffic control devices needed to set up the TTC at a traffic incident should be available so that they can be readily deployed for intermediate traffic incidents. The TTC should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert traffic approaching the queue and to encourage early diversion to an appropriate alternative route.*

<sup>04</sup> *Attention should be paid to the upstream end of the traffic queue such that warning is given to road users approaching the back of the queue.*

<sup>05</sup> *If manual traffic control is needed, it should be provided by qualified flaggers or uniformed law enforcement officers.*

**Option:**

<sup>06</sup> If flaggers are used to provide traffic control for an incident management situation, the flaggers may use appropriate traffic control devices that are readily available or that can be brought to the traffic incident scene on short notice.

**Guidance:**

<sup>07</sup> *When light sticks or flares are used to establish the initial traffic control at incident scenes, channelizing devices (see Section 6F.63) should be installed as soon thereafter as practical.*

**Option:**

<sup>08</sup> The light sticks or flares may remain in place if they are being used to supplement the channelizing devices.

**Guidance:**

<sup>09</sup> *The light sticks, flares, and channelizing devices should be removed after the incident is terminated.*

### **Section 6I.04 Minor Traffic Incidents**

**Support:**

<sup>01</sup> Minor traffic incidents are typically disabled vehicles and minor crashes that result in lane closures of less than 30 minutes. On-scene responders are typically law enforcement and towing companies, and occasionally highway agency service patrol vehicles.

<sup>02</sup> Diversion of traffic into other lanes is often not needed or is needed only briefly. It is not generally possible or practical to set up a lane closure with traffic control devices for a minor traffic incident. Traffic control is the responsibility of on-scene responders.

**Guidance:**

<sup>03</sup> *When a minor traffic incident blocks a travel lane, it should be removed from that lane to the shoulder as quickly as possible.*

### Section 6I.05 Use of Emergency-Vehicle Lighting

#### Support:

01 The use of emergency-vehicle lighting (such as high-intensity rotating, flashing, oscillating, or strobe lights) is essential, especially in the initial stages of a traffic incident, for the safety of emergency responders and persons involved in the traffic incident, as well as road users approaching the traffic incident. Emergency-vehicle lighting, however, provides warning only and provides no effective traffic control. The use of too many lights at an incident scene can be distracting and can create confusion for approaching road users, especially at night. Road users approaching the traffic incident from the opposite direction on a divided facility are often distracted by emergency-vehicle lighting and slow their vehicles to look at the traffic incident posing a hazard to themselves and others traveling in their direction.

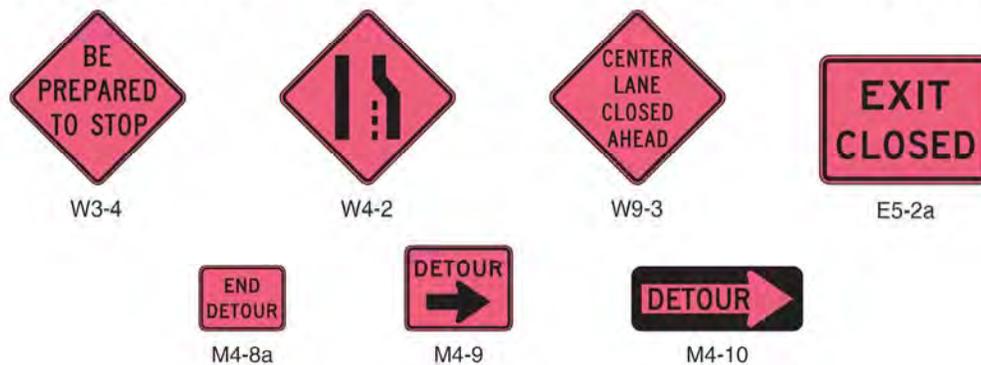
02 The use of emergency-vehicle lighting can be reduced if good traffic control has been established at a traffic incident scene. This is especially true for major traffic incidents that might involve a number of emergency vehicles. If good traffic control is established through placement of advanced warning signs and traffic control devices to divert or detour traffic, then public safety agencies can perform their tasks on scene with minimal emergency-vehicle lighting.

#### Guidance:

03 Public safety agencies should examine their policies on the use of emergency-vehicle lighting, especially after a traffic incident scene is secured, with the intent of reducing the use of this lighting as much as possible while not endangering those at the scene. Special consideration should be given to reducing or extinguishing forward facing emergency-vehicle lighting, especially on divided roadways, to reduce distractions to oncoming road users.

04 Because the glare from floodlights or vehicle headlights can impair the nighttime vision of approaching road users, any floodlights or vehicle headlights that are not needed for illumination, or to provide notice to other road users of an incident response vehicle being in an unexpected location, should be turned off at night.

**Figure 6I-1. Examples of Traffic Incident Management Area Signs**



# Appendices



## APPENDIX A1 CONGRESSIONAL LEGISLATION

### **PUBLIC LAW 102-240-DEC. 18, 1991 (INTERMODAL SURFACE TRANSPORTATION EFFICIENCY ACT OF 1991)**

**Section 1077. REVISION OF MANUAL** — Not later than 90 days after the date of the enactment of this Act, the Secretary shall revise the Manual of Uniform Traffic Control Devices and such other regulations and agreements of the Federal Highway Administration as may be necessary to authorize States and local governments, at their discretion, to install stop or yield signs at any rail-highway grade crossing without automatic traffic control devices with 2 or more trains operating across the rail-highway grade crossing per day.

### **PUBLIC LAW 102-388-OCT. 6, 1992 (DEPARTMENT OF TRANSPORTATION AND RELATED AGENCIES APPROPRIATIONS ACT, 1993)**

**Section 406** — The Secretary of Transportation shall revise the Manual of Uniform Traffic Control Devices to include —

- (a) a standard for a minimum level of retroreflectivity that must be maintained for pavement markings and signs, which shall apply to all roads open to public travel; and
- (b) a standard to define the roads that must have a centerline or edge lines or both, provided that in setting such standard the Secretary shall consider the functional classification of roads, traffic volumes, and the number and width of lanes.

### **PUBLIC LAW 104-59-NOV. 28, 1995 (NATIONAL HIGHWAY SYSTEM DESIGNATION ACT OF 1995)**

**Section 205. RELIEF FROM MANDATES** —

(c) METRIC REQUIREMENTS —

- (1) PLACEMENT AND MODIFICATION OF SIGNS — The Secretary shall not require the States to expend any Federal or State funds to construct, erect, or otherwise place or to modify any sign relating to a speed limit, distance, or other measurement on a highway for the purpose of having such sign establish such speed limit, distance, or other measurement using the metric system.
- (2) OTHER ACTIONS — Before September 30, 2000, the Secretary shall not require that any State use or plan to use the metric system with respect to designing or advertising, or preparing plans, specifications, estimates, or other documents, for a Federal-aid highway project eligible for assistance under title 23, United States Code.
- (3) DEFINITIONS — In this subsection, the following definitions apply:
  - (A) HIGHWAY — The term ‘highway’ has the meaning such term has under section 101 of title 23, United States Code.
  - (B) METRIC SYSTEM — the term ‘metric system’ has the meaning the term ‘metric system of measurement’ has under section 4 of the Metric Conversion Act of 1975 (15 U.S.C. 205c).

**Section 306. MOTORIST CALL BOXES** — Section 111 of title 23, United States Code, is amended by adding at the end the following:

(c) MOTORIST CALL BOXES —

- (1) IN GENERAL — Notwithstanding subsection (a), a State may permit the placement of motorist call boxes on rights-of-way of the National Highway System. Such motorist call boxes may include the identification and sponsorship logos of such call boxes.
- (2) SPONSORSHIP LOGOS —
  - (A) APPROVAL BY STATE AND LOCAL AGENCIES — All call box installations displaying sponsorship logos under this subsection shall be approved by the highway agencies having jurisdiction of the highway on which they are located.
  - (B) SIZE ON BOX — A sponsorship logo may be placed on the call box in a dimension not to exceed the size of the call box or a total dimension in excess of 12 inches by 18 inches.
  - (C) SIZE ON IDENTIFICATION SIGN — Sponsorship logos in a dimension not to exceed 12 inches by 30 inches may be displayed on a call box identification sign affixed to the call box post.
  - (D) SPACING OF SIGNS — Sponsorship logos affixed to an identification sign on a call box post may be located on the rights-of-way at intervals not more frequently than 1 per every 5 miles.

- (E) DISTRIBUTION THROUGHOUT STATE — Within a State, at least 20 percent of the call boxes displaying sponsorship logos shall be located on highways outside of urbanized areas with a population greater than 50,000.
- (3) NONSAFETY HAZARDS — The call boxes and their location, posts, foundations, and mountings shall be consistent with requirements of the Manual on Uniform Traffic Control Devices or any requirements deemed necessary by the Secretary to assure that the call boxes shall not be a safety hazard to motorists.

**Section 353(a) SIGNS** — Traffic control signs referred to in the experimental project conducted in the State of Oregon in December 1991 shall be deemed to comply with the requirements of Section 2B-4 of the Manual on Uniform Traffic Control Devices of the Department of Transportation.

**Section 353(b) STRIPES** — Notwithstanding any other provision of law, a red, white, and blue center line in the Main Street of Bristol, Rhode Island, shall be deemed to comply with the requirements of Section 3B-1 of the Manual on Uniform Traffic Control Devices of the Department of Transportation.

## APPENDIX A2 METRIC CONVERSIONS

Throughout this Manual all dimensions and distances are provided in English units. Tables A2-1 through A2-4 show the equivalent Metric (International System of Units) value for each of the English unit numerical values that are used in this Manual.

**Table A2-1. Conversion of Inches to Millimeters**

Inches	Millimeters	Inches	Millimeters
0.25	6	3.5	87
0.4	10	4	100
0.5	13	4.5	113
0.75	19	5	125
1	25	6	150
1.25	31	8	200
2	50	9	225
2.25	56	10	250
2.5	62	10.4	260
3	75	10.6	265
		12	300
		15	375
		16	400
		18	450
		21	525
		24	600
		27	675
		28	700
		30	750
		32	800

Note: 1 inch = 25.4 millimeters; 1 millimeter = 0.039 inches

**Table A2-2. Conversion of Feet to Meters**

Feet	Meters	Feet	Meters
1	0.3	11	3.4
2	0.6	12	3.7
2.5	0.75	12.75	3.9
3	0.9	14	4.3
3.25	1	15	4.6
3.5	1.1	16	4.9
4	1.2	17	5.2
4.5	1.4	18	5.5
4.75	1.45	19	5.8
5	1.5	20	6.1
5.67	1.7	22	6.7
6	1.8	23.5	7.2
7	2.1	25	7.6
8	2.4	25.6	7.8
9	2.7	30	9
9.25	2.8	32	9.8
9.5	2.9	33	10
10	3	36	11
		40	12
		50	15
		53	16
		60	18
		70	21
		72	22
		75	23
		80	24
		90	27
		95	29
		100	30
		110	34
		120	37
		125	38
		130	675
		140	700
		150	750
		180	800
		200	60
		250	75
		300	90
		330	100
		400	120
		500	150
		530	160
		600	180
		650	200
		700	210
		750	230
		800	245
		1,000	300
		1,500	450
		2,000	600
		2,300	700
		3,000	900

Note: 1 foot = 0.3048 meters; 1 meter = 3.28 feet

**Table A2-3. Conversion of Miles to Kilometers**

Miles	Kilometers	Miles	Kilometers
0.25	0.4	1	1.6
0.5	0.8	2	3.2
0.6	1	3	4.8
		5	8
		10	16
		15	25
		70	110

Note: 1 mile = 1.609 kilometers; 1 kilometer = 0.621 miles

**Table A2-4. Conversion of Miles per Hour to Kilometers/Hour**

mph	km/h	mph	km/h
3	5	25	40
010	16	30	50
15	20	35	60
20	30	40	60
		45	70
		50	80
		55	90
		60	100
		65	105
		65	110
		80	130

Note: 1 mile per hour = 1.609 kilometers/hour; 1 kilometer/hour = 0.621 miles per hour





