

Manual on Uniform Traffic Control Devices

for Streets and Highways

2009 Edition

Including Revision 1 dated May 2012

Revision 2 dated May 2012

and Revision 3 dated July 2022



U.S. Department of Transportation
Federal Highway Administration



Manual on Uniform Traffic Control Devices

2009 Edition

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

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).

Addresses for Publications Referenced in the MUTCD

American Automobile Association (AAA)
1000 AAA Drive
Heathrow, FL 32746
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
202-624-5800

American National Standards Institute (ANSI)
1819 L Street, NW, 6th Floor
Washington, DC 20036
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
301-459-3200

Federal Highway Administration Report Center
Facsimile number: 814-239-2156
report.center@fhwa.dot.gov

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

Institute of Makers of Explosives
1120 19th Street, NW, Suite 310
Washington, DC 20036-3605
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
202-289-0222

International Organization for Standardization
1, ch. de la Voie-Creuse
Case Postale 56
CH-1211
Geneva 20, Switzerland
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
703-525-1695

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

National Electrical Manufacturers Association (NEMA)
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209
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
800-321-6742

Transportation Research Board (TRB)
The National Academies
500 Fifth Street, NW
Washington, DC 20001
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
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 more than 250 voluntary members in the development of this Manual.

Cover photographs © istockphoto.com/“Open Road” by: narvikk; “Road Closed Sign” by: Fred Hall; “Railroad Crossing” by: Michael Krinke. “Green Light” courtesy of Scott Wainwright. “Express Lane Entrance” courtesy of Kevin Sylvester.

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION.....	I-1

PART 1. GENERAL

CHAPTER 1A. GENERAL

Section 1A.01	Purpose of Traffic Control Devices.....	1
Section 1A.02	Principles of Traffic Control Devices	1
Section 1A.03	Design of Traffic Control Devices.....	1
Section 1A.04	Placement and Operation of Traffic Control Devices.....	2
Section 1A.05	Maintenance of Traffic Control Devices	2
Section 1A.06	Uniformity of Traffic Control Devices.....	2
Section 1A.07	Responsibility for Traffic Control Devices.....	2
Section 1A.08	Authority for Placement of Traffic Control Devices	3
Section 1A.09	Engineering Study and Engineering Judgment	4
Section 1A.10	Interpretations, Experimentations, Changes, and Interim Approvals.....	4
Section 1A.11	Relation to Other Publications	7
Section 1A.12	Color Code	10
Section 1A.13	Definitions of Headings, Words, and Phrases in this Manual	10
Section 1A.14	Meanings of Acronyms and Abbreviations in this Manual.....	23
Section 1A.15	Abbreviations Used on Traffic Control Devices.....	24

PART 2. SIGNS

CHAPTER 2A. GENERAL

Section 2A.01	Function and Purpose of Signs	27
Section 2A.02	Definitions	27
Section 2A.03	Standardization of Application	27
Section 2A.04	Excessive Use of Signs	27
Section 2A.05	Classification of Signs	28
Section 2A.06	Design of Signs	28
Section 2A.07	Retroreflectivity and Illumination	29
Section 2A.08	Maintaining Minimum Retroreflectivity	30
Section 2A.09	Shapes	32
Section 2A.10	Sign Colors	32
Section 2A.11	Dimensions.....	32
Section 2A.12	Symbols	34
Section 2A.13	Word Messages	35
Section 2A.14	Sign Borders	36
Section 2A.15	Enhanced Conspicuity for Standard Signs	36
Section 2A.16	Standardization of Location	37
Section 2A.17	Overhead Sign Installations	41
Section 2A.18	Mounting Height	42
Section 2A.19	Lateral Offset	43
Section 2A.20	Orientation	43
Section 2A.21	Posts and Mountings	44
Section 2A.22	Maintenance	44
Section 2A.23	Median Opening Treatments for Divided Highways with Wide Medians	44

CHAPTER 2B. REGULATORY SIGNS, BARRICADES, AND GATES

Section 2B.01	Application of Regulatory Signs	45
Section 2B.02	Design of Regulatory Signs.....	45
Section 2B.03	Size of Regulatory Signs	45
Section 2B.04	Right-of-Way at Intersections	49
Section 2B.05	STOP Sign (R1-1) and ALL WAY Plaque (R1-3P)	51
Section 2B.06	STOP Sign Applications.....	52
Section 2B.07	Multi-Way Stop Applications	52
Section 2B.08	YIELD Sign (R1-2)	53
Section 2B.09	YIELD Sign Applications	53
Section 2B.10	STOP Sign or YIELD Sign Placement.....	53
Section 2B.11	Yield Here To Pedestrians Signs and Stop Here For Pedestrians Signs (R1-5 Series)	54
Section 2B.12	In-Street and Overhead Pedestrian Crossing Signs (R1-6, R1-6a, R1-9, and R1-9a).....	55
Section 2B.13	Speed Limit Sign (R2-1)	56
Section 2B.14	Truck Speed Limit Plaque (R2-2P)	58
Section 2B.15	Night Speed Limit Plaque (R2-3P).....	58
Section 2B.16	Minimum Speed Limit Plaque (R2-4P)	59
Section 2B.17	Higher Fines Signs and Plaque (R2-6P, R2-10, and R2-11)	59
Section 2B.18	Movement Prohibition Signs (R3-1 through R3-4, R3-18, and R3-27)	60
Section 2B.19	Intersection Lane Control Signs (R3-5 through R3-8).....	61
Section 2B.20	Mandatory Movement Lane Control Signs (R3-5, R3-5a, R3-7, and R3-20)	62
Section 2B.21	Optional Movement Lane Control Sign (R3-6).....	63
Section 2B.22	Advance Intersection Lane Control Signs (R3-8 Series).....	64
Section 2B.23	RIGHT (LEFT) LANE MUST EXIT Sign (R3-33)	64
Section 2B.24	Two-Way Left Turn Only Signs (R3-9a, R3-9b)	64
Section 2B.25	BEGIN and END Plaques (R3-9cP, R3-9dP).....	64
Section 2B.26	Reversible Lane Control Signs (R3-9e through R3-9i)	65
Section 2B.27	Jughandle Signs (R3-23, R3-24, R3-25, and R3-26 Series).....	67
Section 2B.28	DO NOT PASS Sign (R4-1)	72
Section 2B.29	PASS WITH CARE Sign (R4-2)	73
Section 2B.30	KEEP RIGHT EXCEPT TO PASS Sign (R4-16) and SLOWER TRAFFIC KEEP RIGHT Sign (R4-3)	73
Section 2B.31	TRUCKS USE RIGHT LANE Sign (R4-5)	73
Section 2B.32	Keep Right and Keep Left Signs (R4-7, R4-8)	73
Section 2B.33	STAY IN LANE Sign (R4-9)	74
Section 2B.34	RUNAWAY VEHICLES ONLY Sign (R4-10).....	74
Section 2B.35	Slow Vehicle Turn-Out Signs (R4-12, R4-13, and R4-14)	74
Section 2B.36	DO NOT DRIVE ON SHOULDER Sign (R4-17) and DO NOT PASS ON SHOULDER Sign (R4-18)	75
Section 2B.37	DO NOT ENTER Sign (R5-1)	75
Section 2B.38	WRONG WAY Sign (R5-1a).....	76
Section 2B.39	Selective Exclusion Signs	76
Section 2B.40	ONE WAY Signs (R6-1, R6-2)	77
Section 2B.41	Wrong-Way Traffic Control at Interchange Ramps	79
Section 2B.42	Divided Highway Crossing Signs (R6-3, R6-3a)	82
Section 2B.43	Roundabout Directional Arrow Signs (R6-4, R6-4a, and R6-4b)	84
Section 2B.44	Roundabout Circulation Plaque (R6-5P)	84
Section 2B.45	Examples of Roundabout Signing	84
Section 2B.46	Parking, Standing, and Stopping Signs (R7 and R8 Series)	88
Section 2B.47	Design of Parking, Standing, and Stopping Signs	89
Section 2B.48	Placement of Parking, Stopping, and Standing Signs.....	92
Section 2B.49	Emergency Restriction Signs (R8-4, R8-7, R8-8).....	92
Section 2B.50	WALK ON LEFT FACING TRAFFIC and No Hitchhiking Signs (R9-1, R9-4, R9-4a).....	92

Section 2B.51	Pedestrian Crossing Signs (R9-2, R9-3)	92
Section 2B.52	Traffic Signal Pedestrian and Bicycle Actuation Signs (R10-1 through R10-4, and R10-24 through R10-26)	94
Section 2B.53	Traffic Signal Signs (R10-5 through R10-30).....	95
Section 2B.54	No Turn on Red Signs (R10-11 Series, R10-17a, and R10-30).....	95
Section 2B.55	Photo Enforced Signs and Plaques (R10-18, R10-19P, R10-19aP).....	97
Section 2B.56	Ramp Metering Signs (R10-28 and R10-29)	97
Section 2B.57	KEEP OFF MEDIAN Sign (R11-1)	97
Section 2B.58	ROAD CLOSED Sign (R11-2) and LOCAL TRAFFIC ONLY Signs (R11-3 Series, R11-4)....	98
Section 2B.59	Weight Limit Signs (R12-1 through R12-5)	98
Section 2B.60	Weigh Station Signs (R13 Series).....	99
Section 2B.61	TRUCK ROUTE Sign (R14-1)	99
Section 2B.62	Hazardous Material Signs (R14-2, R14-3).....	99
Section 2B.63	National Network Signs (R14-4, R14-5).....	100
Section 2B.64	Headlight Use Signs (R16-5 through R16-11)	100
Section 2B.65	FENDER BENDER Sign (R16-4)	101
Section 2B.66	Seat Belt Symbol	101
Section 2B.67	Barricades	101
Section 2B.68	Gates	101

CHAPTER 2C. WARNING SIGNS AND OBJECT MARKERS

Section 2C.01	Function of Warning Signs.....	103
Section 2C.02	Application of Warning Signs	103
Section 2C.03	Design of Warning Signs	103
Section 2C.04	Size of Warning Signs	103
Section 2C.05	Placement of Warning Signs	108
Section 2C.06	Horizontal Alignment Warning Signs.....	109
Section 2C.07	Horizontal Alignment Signs (W1-1 through W1-5, W1-11, W1-15)	110
Section 2C.08	Advisory Speed Plaque (W13-1P)	112
Section 2C.09	Chevron Alignment Sign (W1-8)	112
Section 2C.10	Combination Horizontal Alignment/Advisory Speed Signs (W1-1a, W1-2a).....	113
Section 2C.11	Combination Horizontal Alignment/Intersection Signs (W1-10 Series)	113
Section 2C.12	One-Direction Large Arrow Sign (W1-6)	113
Section 2C.13	Truck Rollover Warning Sign (W1-13).....	114
Section 2C.14	Advisory Exit and Ramp Speed Signs (W13-2 and W13-3).....	114
Section 2C.15	Combination Horizontal Alignment/Advisory Exit and Ramp Speed Signs (W13-6 and W13-7).....	115
Section 2C.16	Hill Signs (W7-1, W7-1a)	115
Section 2C.17	Truck Escape Ramp Signs (W7-4 Series)	115
Section 2C.18	HILL BLOCKS VIEW Sign (W7-6)	117
Section 2C.19	ROAD NARROWS Sign (W5-1).....	117
Section 2C.20	NARROW BRIDGE Sign (W5-2).....	118
Section 2C.21	ONE LANE BRIDGE Sign (W5-3)	118
Section 2C.22	Divided Highway Sign (W6-1)	119
Section 2C.23	Divided Highway Ends Sign (W6-2)	119
Section 2C.24	Freeway or Expressway Ends Signs (W19 Series).....	119
Section 2C.25	Double Arrow Sign (W12-1)	119
Section 2C.26	DEAD END/NO OUTLET Signs (W14-1, W14-1a, W14-2, W14-2a)	119
Section 2C.27	Low Clearance Signs (W12-2 and W12-2a)	120
Section 2C.28	BUMP and DIP Signs (W8-1, W8-2)	120
Section 2C.29	SPEED HUMP Sign (W17-1).....	120
Section 2C.30	PAVEMENT ENDS Sign (W8-3)	122
Section 2C.31	Shoulder Signs (W8-4, W8-9, W8-17, W8-23, and W8-25).....	122
Section 2C.32	Surface Condition Signs (W8-5, W8-7, W8-8, W8-11, W8-13, and W8-14)	122

Section 2C.33	Warning Signs and Plaques for Motorcyclists (W8-15, W8-15P, and W8-16)	123
Section 2C.34	NO CENTER LINE Sign (W8-12)	123
Section 2C.35	Weather Condition Signs (W8-18, W8-19, W8-21, and W8-22).....	123
Section 2C.36	Advance Traffic Control Signs (W3-1, W3-2, W3-3, W3-4)	123
Section 2C.37	Advance Ramp Control Signal Signs (W3-7 and W3-8).....	124
Section 2C.38	Reduced Speed Limit Ahead Signs (W3-5, W3-5a)	124
Section 2C.39	DRAW BRIDGE Sign (W3-6).....	125
Section 2C.40	Merge Signs (W4-1, W4-5).....	125
Section 2C.41	Added Lane Signs (W4-3, W4-6)	126
Section 2C.42	Lane Ends Signs (W4-2, W9-1, W9-2)	126
Section 2C.43	RIGHT (LEFT) LANE EXIT ONLY AHEAD Sign (W9-7)	126
Section 2C.44	Two-Way Traffic Sign (W6-3)	127
Section 2C.45	NO PASSING ZONE Sign (W14-3).....	127
Section 2C.46	Intersection Warning Signs (W2-1 through W2-8)	127
Section 2C.47	Two-Direction Large Arrow Sign (W1-7)	128
Section 2C.48	Traffic Signal Signs (W25-1, W25-2)	128
Section 2C.49	Vehicular Traffic Warning Signs (W8-6, W11-1, W11-5, W11-5a, W11-8, W11-10, W11-11, W11-12P, W11-14, W11-15, and W11-15a).....	128
Section 2C.50	Non-Vehicular Warning Signs (W11-2, W11-3, W11-4, W11-6, W11-7, W11-9, and W11-16 through W11-22).....	130
Section 2C.51	Playground Sign (W15-1)	131
Section 2C.52	NEW TRAFFIC PATTERN AHEAD Sign (W23-2)	131
Section 2C.53	Use of Supplemental Warning Plaques	131
Section 2C.54	Design of Supplemental Warning Plaques	132
Section 2C.55	Distance Plaques (W16-2 Series, W16-3 Series, W16-4P, W7-3aP)	132
Section 2C.56	Supplemental Arrow Plaques (W16-5P, W16-6P)	132
Section 2C.57	Hill-Related Plaques (W7-2 Series, W7-3 Series)	133
Section 2C.58	Advance Street Name Plaque (W16-8P, W16-8aP)	133
Section 2C.59	CROSS TRAFFIC DOES NOT STOP Plaque (W4-4P)	133
Section 2C.60	SHARE THE ROAD Plaque (W16-1P)	133
Section 2C.61	Photo Enforced Plaque (W16-10P).....	134
Section 2C.62	NEW Plaque (W16-15P)	134
Section 2C.63	Object Marker Design and Placement Height	134
Section 2C.64	Object Markers for Obstructions Within the Roadway	135
Section 2C.65	Object Markers for Obstructions Adjacent to the Roadway	135
Section 2C.66	Object Markers for Ends of Roadways.....	136

CHAPTER 2D. GUIDE SIGNS—CONVENTIONAL ROADS

Section 2D.01	Scope of Conventional Road Guide Sign Standards	137
Section 2D.02	Application	137
Section 2D.03	Color, Retroreflection, and Illumination.....	137
Section 2D.04	Size of Signs	137
Section 2D.05	Lettering Style.....	138
Section 2D.06	Size of Lettering.....	138
Section 2D.07	Amount of Legend	140
Section 2D.08	Arrows.....	140
Section 2D.09	Numbered Highway Systems	142
Section 2D.10	Route Signs and Auxiliary Signs	142
Section 2D.11	Design of Route Signs	143
Section 2D.12	Design of Route Sign Auxiliaries.....	144
Section 2D.13	Junction Auxiliary Sign (M2-1)	144
Section 2D.14	Combination Junction Sign (M2-2)	145
Section 2D.15	Cardinal Direction Auxiliary Signs (M3-1 through M3-4)	145
Section 2D.16	Auxiliary Signs for Alternative Routes (M4 Series)	145

Section 2D.17	ALTERNATE Auxiliary Signs (M4-1, M4-1a)	145
Section 2D.18	BY-PASS Auxiliary Sign (M4-2)	146
Section 2D.19	BUSINESS Auxiliary Sign (M4-3)	146
Section 2D.20	TRUCK Auxiliary Sign (M4-4)	146
Section 2D.21	TO Auxiliary Sign (M4-5)	146
Section 2D.22	END Auxiliary Sign (M4-6)	146
Section 2D.23	BEGIN Auxiliary Sign (M4-14)	146
Section 2D.24	TEMPORARY Auxiliary Signs (M4-7, M4-7a)	147
Section 2D.25	Temporary Detour and Auxiliary Signs	147
Section 2D.26	Advance Turn Arrow Auxiliary Signs (M5-1, M5-2, and M5-3)	147
Section 2D.27	Lane Designation Auxiliary Signs (M5-4, M5-5, and M5-6)	148
Section 2D.28	Directional Arrow Auxiliary Signs (M6 Series)	148
Section 2D.29	Route Sign Assemblies	148
Section 2D.30	Junction Assembly	153
Section 2D.31	Advance Route Turn Assembly	153
Section 2D.32	Directional Assembly	153
Section 2D.33	Combination Lane-Use/Destination Overhead Guide Sign (D15-1)	154
Section 2D.34	Confirming or Reassurance Assemblies	155
Section 2D.35	Trailblazer Assembly	155
Section 2D.36	Destination and Distance Signs	156
Section 2D.37	Destination Signs (D1 Series)	156
Section 2D.38	Destination Signs at Circular Intersections	157
Section 2D.39	Destination Signs at Jughandles	158
Section 2D.40	Location of Destination Signs	158
Section 2D.41	Distance Signs (D2 Series)	161
Section 2D.42	Location of Distance Signs	161
Section 2D.43	Street Name Signs (D3-1 or D3-1a)	161
Section 2D.44	Advance Street Name Signs (D3-2)	163
Section 2D.45	Signing on Conventional Roads on Approaches to Interchanges	164
Section 2D.46	Freeway Entrance Signs (D13-3 and D13-3a)	170
Section 2D.47	Parking Area Guide Sign (D4-1)	171
Section 2D.48	PARK - RIDE Sign (D4-2)	171
Section 2D.49	Weigh Station Signing (D8 Series)	172
Section 2D.50	Community Wayfinding Signs	172
Section 2D.51	Truck, Passing, or Climbing Lane Signs (D17-1 and D17-2)	178
Section 2D.52	Slow Vehicle Turn-Out Sign (D17-7)	178
Section 2D.53	Signing of Named Highways	179
Section 2D.54	Crossover Signs (D13-1 and D13-2)	179
Section 2D.55	National Scenic Byways Signs (D6-4, D6-4a)	179

CHAPTER 2E. GUIDE SIGNS—FREEWAYS AND EXPRESSWAYS

Section 2E.01	Scope of Freeway and Expressway Guide Sign Standards	181
Section 2E.02	Freeway and Expressway Signing Principles	181
Section 2E.03	Guide Sign Classification	181
Section 2E.04	General	182
Section 2E.05	Color of Guide Signs	182
Section 2E.06	Retroreflection or Illumination	182
Section 2E.07	Characteristics of Urban Signing	182
Section 2E.08	Characteristics of Rural Signing	183
Section 2E.09	Signing of Named Highways	183
Section 2E.10	Amount of Legend on Guide Signs	183
Section 2E.11	Number of Signs at an Overhead Installation and Sign Spreading	183
Section 2E.12	Pull-Through Signs (E6-2, E6-2a)	184
Section 2E.13	Designation of Destinations	184

Section 2E.14	Size and Style of Letters and Signs	185
Section 2E.15	Interline and Edge Spacing	185
Section 2E.16	Sign Borders	192
Section 2E.17	Abbreviations	192
Section 2E.18	Symbols	192
Section 2E.19	Arrows for Interchange Guide Signs	192
Section 2E.20	Signing for Option Lanes at Splits and Multi-Lane Exits	193
Section 2E.21	Design of Overhead Arrow-per-Lane Guide Signs for Option Lanes	193
Section 2E.22	Design of Freeway and Expressway Diagrammatic Guide Signs for Option Lanes	198
Section 2E.23	Signing for Intermediate and Minor Interchange Multi-Lane Exits with an Option Lane.....	203
Section 2E.24	Signing for Interchange Lane Drops	203
Section 2E.25	Overhead Sign Installations	206
Section 2E.26	Lateral Offset	210
Section 2E.27	Route Signs and Trailblazer Assemblies	210
Section 2E.28	Eisenhower Interstate System Signs (M1-10, M1-10a)	211
Section 2E.29	Signs for Intersections at Grade	211
Section 2E.30	Interchange Guide Signs	211
Section 2E.31	Interchange Exit Numbering	212
Section 2E.32	Interchange Classification	216
Section 2E.33	Advance Guide Signs	216
Section 2E.34	Next Exit Plaques	218
Section 2E.35	Other Supplemental Guide Signs	218
Section 2E.36	Exit Direction Signs	220
Section 2E.37	Exit Gore Signs (E5-1 Series)	222
Section 2E.38	Post-Interchange Signs	222
Section 2E.39	Post-Interchange Distance Signs	223
Section 2E.40	Interchange Sequence Signs	223
Section 2E.41	Community Interchanges Identification Signs	225
Section 2E.42	NEXT XX EXITS Sign	225
Section 2E.43	Signing by Type of Interchange	226
Section 2E.44	Freeway-to-Freeway Interchange	226
Section 2E.45	Cloverleaf Interchange	226
Section 2E.46	Cloverleaf Interchange with Collector-Distributor Roadways	230
Section 2E.47	Partial Cloverleaf Interchange	230
Section 2E.48	Diamond Interchange	230
Section 2E.49	Diamond Interchange in Urban Area	234
Section 2E.50	Closely-Spaced Interchanges	234
Section 2E.51	Minor Interchange	234
Section 2E.52	Signing on Conventional Road Approaches and Connecting Roadways.....	235
Section 2E.53	Wrong-Way Traffic Control at Interchange Ramps	235
Section 2E.54	Weigh Station Signing	236

CHAPTER 2F. TOLL ROAD SIGNS

Section 2F.01	Scope	237
Section 2F.02	Sizes of Toll Road Signs	237
Section 2F.03	Use of Purple Backgrounds and Underlay Panels with ETC Account Pictographs	238
Section 2F.04	Size of ETC Pictographs	238
Section 2F.05	Regulatory Signs for Toll Plazas	238
Section 2F.06	Pay Toll Advance Warning Sign (W9-6)	240
Section 2F.07	Pay Toll Advance Warning Plaque (W9-6P).....	241
Section 2F.08	Stop Ahead Pay Toll Warning Sign (W9-6a)	242
Section 2F.09	Stop Ahead Pay Toll Warning Plaque (W9-6aP)	242
Section 2F.10	LAST EXIT BEFORE TOLL Warning Plaque (W16-16P)	242
Section 2F.11	TOLL Auxiliary Sign (M4-15)	242

Section 2F.12	Electronic Toll Collection (ETC) Account-Only Auxiliary Signs (M4-16 and M4-20).....	243
Section 2F.13	Toll Facility and Toll Plaza Guide Signs – General	243
Section 2F.14	Advance Signs for Conventional Toll Plazas.....	248
Section 2F.15	Advance Signs for Toll Plazas on Diverging Alignments from Open-Road ETC Account-Only Lanes	249
Section 2F.16	Toll Plaza Canopy Signs.....	252
Section 2F.17	Guide Signs for Entrances to ETC Account-Only Facilities	252
Section 2F.18	ETC Program Information Signs	252

CHAPTER 2G. PREFERENTIAL AND MANAGED LANE SIGNS

Section 2G.01	Scope	253
Section 2G.02	Sizes of Preferential and Managed Lane Signs	253
Section 2G.03	Regulatory Signs for Preferential Lanes – General	253
Section 2G.04	Preferential Lane Vehicle Occupancy Definition Regulatory Signs (R3-10 Series and R3-13 Series)	258
Section 2G.05	Preferential Lane Periods of Operation Regulatory Signs (R3-11 Series and R3-14 Series) ...	259
Section 2G.06	Preferential Lane Advance Regulatory Signs (R3-12, R3-12e, R3-12f, R3-15, R3-15a, and R3-15d)	263
Section 2G.07	Preferential Lane Ends Regulatory Signs (R3-12a, R3-12b, R3-12c, R3-12d, R3-12g, R3-12h, R3-15b, R3-15c, and R3-15e)	263
Section 2G.08	Warning Signs on Median Barriers for Preferential Lanes	263
Section 2G.09	High-Occupancy Vehicle (HOV) Plaque (W16-11P)	264
Section 2G.10	Preferential Lane Guide Signs – General	265
Section 2G.11	Guide Signs for Initial Entry Points to Preferential Lanes	267
Section 2G.12	Guide Signs for Intermediate Entry Points to Preferential Lanes	268
Section 2G.13	Guide Signs for Egress from Preferential Lanes to General-Purpose Lanes	270
Section 2G.14	Guide Signs for Direct Entrances to Preferential Lanes from Another Highway	273
Section 2G.15	Guide Signs for Direct Exits from Preferential Lanes to Another Highway	273
Section 2G.16	Signs for Priced Managed Lanes – General	276
Section 2G.17	Regulatory Signs for Priced Managed Lanes	279
Section 2G.18	Guide Signs for Priced Managed Lanes	279

CHAPTER 2H. GENERAL INFORMATION SIGNS

Section 2H.01	Sizes of General Information Signs	292
Section 2H.02	General Information Signs (I Series).....	292
Section 2H.03	Traffic Signal Speed Sign (I1-1)	294
Section 2H.04	Miscellaneous Information Signs.....	294
Section 2H.05	Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a)	294
Section 2H.06	Enhanced Reference Location Signs (D10-4, D10-5).....	296
Section 2H.07	Auto Tour Route Signs	297
Section 2H.08	Acknowledgment Signs	297

CHAPTER 2I. GENERAL SERVICE SIGNS

Section 2I.01	Sizes of General Service Signs.....	299
Section 2I.02	General Service Signs for Conventional Roads.....	300
Section 2I.03	General Service Signs for Freeways and Expressways	303
Section 2I.04	Interstate Oasis Signing.....	306
Section 2I.05	Rest Area and Other Roadside Area Signs.....	307
Section 2I.06	Brake Check Area Signs (D5-13 and D5-14)	308
Section 2I.07	Chain-Up Area Signs (D5-15 and D5-16)	308
Section 2I.08	Tourist Information and Welcome Center Signs	308
Section 2I.09	Radio Information Signing.....	310
Section 2I.10	TRAVEL INFO CALL 511 Signs (D12-5 and D12-5a).....	311
Section 2I.11	Carpool and Ridesharing Signing	311

CHAPTER 2J. SPECIFIC SERVICE SIGNS

Section 2J.01	Eligibility	312
Section 2J.02	Application	313
Section 2J.03	Logos and Logo Sign Panels	313
Section 2J.04	Number and Size of Signs and Logo Sign Panels	317
Section 2J.05	Size of Lettering.....	317
Section 2J.06	Signs at Interchanges.....	317
Section 2J.07	Single-Exit Interchanges	317
Section 2J.08	Double-Exit Interchanges.....	318
Section 2J.09	Specific Service Trailblazer Signs.....	318
Section 2J.10	Signs at Intersections.....	319
Section 2J.11	Signing Policy	319

CHAPTER 2K. TOURIST-ORIENTED DIRECTIONAL SIGNS

Section 2K.01	Purpose and Application	320
Section 2K.02	Design	320
Section 2K.03	Style and Size of Lettering	323
Section 2K.04	Arrangement and Size of Signs	323
Section 2K.05	Advance Signs	323
Section 2K.06	Sign Locations.....	324
Section 2K.07	State Policy	324

CHAPTER 2L. CHANGEABLE MESSAGE SIGNS

Section 2L.01	Description of Changeable Message Signs.....	325
Section 2L.02	Applications of Changeable Message Signs	325
Section 2L.03	Legibility and Visibility of Changeable Message Signs.....	326
Section 2L.04	Design Characteristics of Changeable Message Signs	326
Section 2L.05	Message Length and Units of Information	328
Section 2L.06	Installation of Permanent Changeable Message Signs	329

CHAPTER 2M. RECREATIONAL AND CULTURAL INTEREST AREA SIGNS

Section 2M.01	Scope	330
Section 2M.02	Application of Recreational and Cultural Interest Area Signs	330
Section 2M.03	Regulatory and Warning Signs	330
Section 2M.04	General Design Requirements for Recreational and Cultural Interest Area Symbol Guide Signs	330
Section 2M.05	Symbol Sign Sizes	332
Section 2M.06	Use of Educational Plaques	332
Section 2M.07	Use of Prohibitive Circle and Diagonal Slash for Non-Road Applications	332
Section 2M.08	Placement of Recreational and Cultural Interest Area Symbol Signs	332
Section 2M.09	Destination Guide Signs	333
Section 2M.10	Memorial or Dedication Signing	339

CHAPTER 2N. EMERGENCY MANAGEMENT SIGNING

Section 2N.01	Emergency Management	342
Section 2N.02	Design of Emergency Management Signs	342
Section 2N.03	Evacuation Route Signs (EM-1 and EM-1a)	342
Section 2N.04	AREA CLOSED Sign (EM-2)	344
Section 2N.05	TRAFFIC CONTROL POINT Sign (EM-3)	344
Section 2N.06	MAINTAIN TOP SAFE SPEED Sign (EM-4)	344
Section 2N.07	ROAD (AREA) USE PERMIT REQUIRED FOR THRU TRAFFIC Sign (EM-5)	345
Section 2N.08	Emergency Aid Center Signs (EM-6 Series).....	345
Section 2N.09	Shelter Directional Signs (EM-7 Series)	346

PART 3. MARKINGS

CHAPTER 3A. GENERAL

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

CHAPTER 3B. PAVEMENT AND CURB MARKINGS

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

Rev. 3

CHAPTER 3C. ROUNDABOUT MARKINGS

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

CHAPTER 3D. MARKINGS FOR PREFERENTIAL LANES

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

CHAPTER 3E. MARKINGS FOR TOLL PLAZAS

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

CHAPTER 3F Delineators

Section 3F.01	Delineators	425
Section 3F.02	Delineator Design	425
Section 3F.03	Delineator Application	425
Section 3F.04	Delineator Placement and Spacing.....	427

CHAPTER 3G Colored Pavements

Section 3G.01	General	429
---------------	---------------	-----

CHAPTER 3H CHANNELIZING DEVICES USED FOR EMPHASIS OF PAVEMENT MARKING PATTERNS

Section 3H.01	Channelizing Devices	430
---------------	----------------------------	-----

CHAPTER 3I ISLANDS

Section 3I.01	General	431
Section 3I.02	Approach-End Treatment	431
Section 3I.03	Island Marking Application	431
Section 3I.04	Island Marking Colors	431
Section 3I.05	Island Delineation	432
Section 3I.06	Pedestrian Islands and Medians	432

CHAPTER 3J Rumble Strip Markings

Section 3J.01	Longitudinal Rumble Strip Markings	433
Section 3J.02	Transverse Rumble Strip Markings.....	433

PART 4 HIGHWAY TRAFFIC SIGNALS

Rev. 3

CHAPTER 4A GENERAL

Section 4A.01	Types	435
Section 4A.02	Definitions Relating to Highway Traffic Signals.....	435

CHAPTER 4B TRAFFIC CONTROL SIGNALS—GENERAL

Section 4B.01	General	436
Section 4B.02	Basis of Installation or Removal of Traffic Control Signals.....	436
Section 4B.03	Advantages and Disadvantages of Traffic Control Signals	436
Section 4B.04	Alternatives to Traffic Control Signals.....	437
Section 4B.05	Adequate Roadway Capacity.....	437

CHAPTER 4C TRAFFIC CONTROL SIGNAL NEEDS STUDIES

Section 4C.01	Studies and Factors for Justifying Traffic Control Signals.....	438
Section 4C.02	Warrant 1, Eight-Hour Vehicular Volume	439
Section 4C.03	Warrant 2, Four-Hour Vehicular Volume	441
Section 4C.04	Warrant 3, Peak Hour	441
Section 4C.05	Warrant 4, Pedestrian Volume.....	444
Section 4C.06	Warrant 5, School Crossing.....	444
Section 4C.07	Warrant 6, Coordinated Signal System	447
Section 4C.08	Warrant 7, Crash Experience.....	447
Section 4C.09	Warrant 8, Roadway Network	448
Section 4C.10	Warrant 9, Intersection Near a Grade Crossing.....	448

CHAPTER 4D TRAFFIC CONTROL SIGNAL FEATURES

Section 4D.01	General	451
Section 4D.02	Responsibility for Operation and Maintenance	451
Section 4D.03	Provisions for Pedestrians	453
Section 4D.04	Meaning of Vehicular Signal Indications	452

Section 4D.05	Application of Steady Signal Indications	455
Section 4D.06	Signal Indications – Design, Illumination, Color, and Shape.....	457
Section 4D.07	Size of Vehicular Signal Indications	458
Section 4D.08	Positions of Signal Indications Within a Signal Face – General	459
Section 4D.09	Positions of Signal Indications Within a Vertical Signal Face	459
Section 4D.10	Positions of Signal Indications Within a Horizontal Signal Face.....	461
Section 4D.11	Number of Signal Faces on an Approach.....	461
Section 4D.12	Visibility, Aiming, and Shielding of Signal Faces.....	463
Section 4D.13	Lateral Positioning of Signal Faces	465
Section 4D.14	Longitudinal Positioning of Signal Faces.....	466
Section 4D.15	Mounting Height of Signal Faces	467
Section 4D.16	Lateral Offset (Clearance) of Signal Faces.....	467
Section 4D.17	Signal Indications for Left-Turn Movements – General	467
Section 4D.18	Signal Indications for Permissive Only Mode Left-Turn Movements	469
Section 4D.19	Signal Indications for Protected Only Mode Left-Turn Movements	471
Section 4D.20	Signal Indications for Protected/Permissive Mode Left-Turn Movements.....	473
Section 4D.21	Signal Indications for Right-Turn Movements – General	476
Section 4D.22	Signal Indications for Permissive Only Mode Right-Turn Movements	477
Section 4D.23	Signal Indications for Protected Only Mode Right-Turn Movements	480
Section 4D.24	Signal Indications for Protected/Permissive Mode Right-Turn Movements	482
Section 4D.25	Signal Indications for Approaches With Shared Left-Turn/Right-Turn Lanes and No Through Movement	486
Section 4D.26	Yellow Change and Red Clearance Intervals	487
Section 4D.27	Preemption and Priority Control of Traffic Control Signals	491
Section 4D.28	Flashing Operation of Traffic Control Signals – General	493
Section 4D.29	Flashing Operation – Transition Into Flashing Mode	493
Section 4D.30	Flashing Operation – Signal Indications During Flashing Mode	493
Section 4D.31	Flashing Operation – Transition Out of Flashing Mode	494
Section 4D.32	Temporary and Portable Traffic Control Signals	494
Section 4D.33	Lateral Offset of Signal Supports and Cabinets	495
Section 4D.34	Use of Signs at Signalized Locations	495
Section 4D.35	Use of Pavement Markings at Signalized Locations	496

Rev. 3

CHAPTER 4E PEDESTRIAN CONTROL FEATURES

Section 4E.01	Pedestrian Signal Heads	497
Section 4E.02	Meaning of Pedestrian Signal Head Indications	497
Section 4E.03	Application of Pedestrian Signal Heads	497
Section 4E.04	Size, Design, and Illumination of Pedestrian Signal Head Indications	498
Section 4E.05	Location and Height of Pedestrian Signal Heads	499
Section 4E.06	Pedestrian Intervals and Signal Phases	499
Section 4E.07	Countdown Pedestrian Signals	501
Section 4E.08	Pedestrian Detectors	502
Section 4E.09	Accessible Pedestrian Signals and Detectors – General	506
Section 4E.10	Accessible Pedestrian Signals and Detectors – Location	507
Section 4E.11	Accessible Pedestrian Signals and Detectors – Walk Indications	507
Section 4E.12	Accessible Pedestrian Signals and Detectors – Tactile Arrows and Locator Tones	509
Section 4E.13	Accessible Pedestrian Signals and Detectors – Extended Pushbutton Press Features	509

CHAPTER 4F PEDESTRIAN HYBRID BEACONS

Section 4F.01	Application of Pedestrian Hybrid Beacons	511
Section 4F.02	Design of Pedestrian Hybrid Beacons	511
Section 4F.03	Operation of Pedestrian Hybrid Beacons	513

CHAPTER 4G TRAFFIC CONTROL SIGNALS AND HYBRID BEACONS FOR EMERGENCY-VEHICLE ACCESS

Section 4G.01	Application of Emergency-Vehicle Traffic Control Signals and Hybrid Beacons	515
Section 4G.02	Design of Emergency-Vehicle Traffic Control Signals	515
Section 4G.03	Operation of Emergency-Vehicle Traffic Control Signals	515
Section 4G.04	Emergency-Vehicle Hybrid Beacons	516

CHAPTER 4H TRAFFIC CONTROL SIGNALS FOR ONE-LANE, TWO-WAY FACILITIES

Section 4H.01	Application of Traffic Control Signals for One-Lane, Two-Way Facilities	518
Section 4H.02	Design of Traffic Control Signals for One-Lane, Two-Way Facilities	518
Section 4H.03	Operation of Traffic Control Signals for One-Lane, Two-Way Facilities	518

CHAPTER 4I TRAFFIC CONTROL SIGNALS FOR FREEWAY ENTRANCE RAMPS

Section 4I.01	Application of Freeway Entrance Ramp Control Signals.....	519
Section 4I.02	Design of Freeway Entrance Ramp Control Signals	519
Section 4I.03	Operation of Freeway Entrance Ramp Control Signals	520

CHAPTER 4J TRAFFIC CONTROL FOR MOBILE BRIDGES

Section 4J.01	Application of Traffic Control for Movable Bridges	521
Section 4J.02	Design and Location of Movable Bridge Signals and Gates	521
Section 4J.03	Operation of Movable Bridge Signals and Gates	523

CHAPTER 4K HIGHWAY TRAFFIC SIGNALS AT TOLL PLAZAS

Section 4K.01	Traffic Signals at Toll Plazas	524
Section 4K.02	Lane-Use Control Signals at or Near Toll Plazas	524
Section 4K.03	Warning Beacons at Toll Plazas	524

CHAPTER 4L FLASHING BEACONS

Section 4L.01	General Design and Operation of Flashing Beacons	525
Section 4L.02	Intersection Control Beacon.....	525
Section 4L.03	Warning Beacon.....	525
Section 4L.04	Speed Limit Sign Beacon.....	526
Section 4L.05	Stop Beacon	526

CHAPTER 4M LANE-USE CONTROL SIGNALS

Section 4M.01	Application of Lane-Use Control Signals	527
Section 4M.02	Meaning of Lane-Use Control Signal Indications.....	527
Section 4M.03	Design of Lane-Use Control Signals	528
Section 4M.04	Operation of Lane-Use Control Signals	529

CHAPTER 4N IN-ROADWAY LIGHTS

Section 4N.01	Application of In-Roadway Lights	530
Section 4N.02	In-Roadway Warning Lights at Crosswalks	530

PART 5 TRAFFIC CONTROL DEVICES FOR LOW-VOLUME ROADS

CHAPTER 5A GENERAL

Section 5A.01	Function	533
Section 5A.02	Application	533
Section 5A.03	Design	533
Section 5A.04	Placement	535

CHAPTER 5B REGULATORY SIGNS

Section 5B.01	Introduction	536
Section 5B.02	STOP and YIELD Signs (R1-1 and R1-2)	536

Section 5B.03	Speed Limit Signs (R2 Series)	536
Section 5B.04	Traffic Movement and Prohibition Signs (R3, R4, R5, R6, R9, R10, R11, R12, R13, and R14 Series)	537
Section 5B.05	Parking Signs (R8 Series)	537
Section 5B.06	Other Regulatory Signs	537

CHAPTER 5C WARNING SIGNS

Section 5C.01	Introduction	538
Section 5C.02	Horizontal Alignment Signs (W1-1 through W1-8)	538
Section 5C.03	Intersection Warning Signs (W2-1 through W2-6)	539
Section 5C.04	Stop Ahead and Yield Ahead Signs (W3-1, W3-2)	539
Section 5C.05	NARROW BRIDGE Sign (W5-2)	539
Section 5C.06	ONE LANE BRIDGE Sign (W5-3)	539
Section 5C.07	Hill Sign (W7-1)	539
Section 5C.08	PAVEMENT ENDS Sign (W8-3)	539
Section 5C.09	Vehicular Traffic Warning and Non-Vehicular Warning Signs (W11 Series and W8-6)	539
Section 5C.10	Advisory Speed Plaque (W13-1P)	541
Section 5C.11	DEAD END or NO OUTLET Signs (W14-1, W14-1a, W14-2, W14-2a)	541
Section 5C.12	NO TRAFFIC SIGNS Sign (W18-1).....	541
Section 5C.13	Other Warning Signs.....	541
Section 5C.14	Object Markers and Barricades.....	541

CHAPTER 5D GUIDE SIGNS

Section 5D.01	Introduction	542
---------------	--------------------	-----

Rev. 3

CHAPTER 5E MARKINGS

Section 5E.01	Introduction	543
Section 5E.02	Center Line Markings	543
Section 5E.03	Edge Line Markings.....	543
Section 5E.04	Delineators	543
Section 5E.05	Other Markings	543

CHAPTER 5F TRAFFIC CONTROL FOR HIGHWAY-RAIL GRADE CROSSINGS

Section 5F.01	Introduction	544
Section 5F.02	Grade Crossing (Crossbuck) Sign and Number of Tracks Plaque (R15-1, R15-2P)	544
Section 5F.03	Grade Crossing Advance Warning Signs (W10 Series)	544
Section 5F.04	STOP and YIELD Signs (R1-1, R1-2)	545
Section 5F.05	Pavement Markings	545
Section 5F.06	Other Traffic Control Devices	545

CHAPTER 5G TEMPORARY TRAFFIC CONTROL ZONES

Section 5G.01	Introduction	546
Section 5G.02	Applications	546
Section 5G.03	Channelization Devices.....	546
Section 5G.04	Markings	547
Section 5G.05	Other Traffic Control Devices	547

CHAPTER 5H TRAFFIC CONTROL FOR SCHOOL AREAS

Section 5H.01	Introduction	548
---------------	--------------------	-----

PART 6 TEMPORARY TRAFFIC CONTROL**CHAPTER 6A GENERAL**

Section 6A.01	General	549
---------------	---------------	-----

CHAPTER 6B FUNDAMENTAL PRINCIPLES

Section 6B.01	Fundamental Principles of Temporary Traffic Control	551
---------------	---	-----

CHAPTER 6C TEMPORARY TRAFFIC CONTROL ELEMENTS

Section 6C.01	Temporary Traffic Control Plans.....	553
Section 6C.02	Temporary Traffic Control Zones	554
Section 6C.03	Components of Temporary Traffic Control Zones	554
Section 6C.04	Advance Warning Area	554
Section 6C.05	Transition Area.....	556
Section 6C.06	Activity Area.....	556
Section 6C.07	Termination Area	557
Section 6C.08	Tapers	557
Section 6C.09	Detours and Diversions	560
Section 6C.10	One-Lane, Two-Way Traffic Control.....	560
Section 6C.11	Flagger Method of One-Lane, Two-Way Traffic Control	560
Section 6C.12	Flag Transfer Method of One-Lane, Two-Way Traffic Control	560
Section 6C.13	Pilot Car Method of One-Lane, Two-Way Traffic Control.....	562
Section 6C.14	Temporary Traffic Control Signal Method of One-Lane, Two-Way Traffic Control.....	562
Section 6C.15	Stop or Yield Control Method of One-Lane, Two-Way Traffic Control	562

CHAPTER 6D PEDESTRIAN AND WORKER SAFETY

Section 6D.01	Pedestrian Considerations	563
Section 6D.02	Accessibility Considerations	565
Section 6D.03	Worker Safety Considerations	566

CHAPTER 6E FLAGGER CONTROL

Section 6E.01	Qualifications for Flaggers	568
Section 6E.02	High-Visibility Safety Apparel	568
Section 6E.03	Hand-Signaling Devices.....	568
Section 6E.04	Automated Flagger Assistance Devices	569
Section 6E.05	STOP/SLOW Automated Flagger Assistance Devices	570
Section 6E.06	Red/Yellow Lens Automated Flagger Assistance Devices	573
Section 6E.07	Flagger Procedures	575
Section 6E.08	Flagger Stations.....	577

CHAPTER 6F TEMPORARY TRAFFIC CONTROL ZONE DEVICES

Section 6F.01	Types of Devices	578
Section 6F.02	General Characteristics of Signs	578
Section 6F.03	Sign Placement	579
Section 6F.04	Sign Maintenance.....	585
Section 6F.05	Regulatory Sign Authority	585
Section 6F.06	Regulatory Sign Design	585
Section 6F.07	Regulatory Sign Applications	585
Section 6F.08	ROAD (STREET) CLOSED Sign (R11-2)	585
Section 6F.09	Local Traffic Only Signs (R11-3a, R11-4)	587
Section 6F.10	Weight Limit Signs (R12-1, R12-2, R12-5)	587
Section 6F.11	STAY IN LANE Sign (R4-9).....	588
Section 6F.12	Work Zone and Higher Fines Signs and Plaques	588
Section 6F.13	PEDESTRIAN CROSSWALK Sign (R9-8)	588
Section 6F.14	SIDEWALK CLOSED Signs (R9-9, R9-10, R9-11, R9-11a)	588

Section 6F.15	Special Regulatory Signs	589
Section 6F.16	Warning Sign Function, Design, and Application.....	589
Section 6F.17	Position of Advance Warning Signs.....	589
Section 6F.18	ROAD (STREET) WORK Sign (W20-1).....	593
Section 6F.19	DETOUR Sign (W20-2)	593
Section 6F.20	ROAD (STREET) CLOSED Sign (W20-3)	593
Section 6F.21	ONE LANE ROAD Sign (W20-4)	593
Section 6F.22	Lane(s) Closed Signs (W20-5, W20-5a)	593
Section 6F.23	CENTER LANE CLOSED AHEAD Sign (W9-3).....	594
Section 6F.24	Lane Ends Sign (W4-2)	594
Section 6F.25	ON RAMP Plaque (W13-4P)	594
Section 6F.26	RAMP NARROWS Sign (W5-4)	594
Section 6F.27	SLOW TRAFFIC AHEAD Sign (W23-1)	594
Section 6F.28	EXIT OPEN and EXIT CLOSED Signs (E5-2, E5-2a)	594
Section 6F.29	EXIT ONLY Sign (E5-3)	595
Section 6F.30	NEW TRAFFIC PATTERN AHEAD Sign (W23-2)	595
Section 6F.31	Flagger Signs (W20-7, W20-7a)	595
Section 6F.32	Two-Way Traffic Sign (W6-3)	595
Section 6F.33	Workers Signs (W21-1, W21-1a)	595
Section 6F.34	FRESH OIL (TAR) Sign (W21-2)	595
Section 6F.35	ROAD MACHINERY AHEAD Sign (W21-3)	595
Section 6F.36	Motorized Traffic Signs (W8-6, W11-10).....	596
Section 6F.37	Shoulder Work Signs (W21-5, W21-5a, W21-5b)	596
Section 6F.38	SURVEY CREW Sign (W21-6)	596
Section 6F.39	UTILITY WORK Sign (W21-7)	596
Section 6F.40	Signs for Blasting Areas.....	596
Section 6F.41	BLASTING ZONE AHEAD Sign (W22-1).....	597
Section 6F.42	TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2)	597
Section 6F.43	END BLASTING ZONE Sign (W22-3)	597
Section 6F.44	Shoulder Signs and Plaque (W8-4, W8-9, W8-17, and W8-17P)	597
Section 6F.45	UNEVEN LANES Sign (W8-11)	597
Section 6F.46	STEEL PLATE AHEAD Sign (W8-24)	597
Section 6F.47	NO CENTER LINE Sign (W8-12)	597
Section 6F.48	Reverse Curve Signs (W1-4 Series)	598
Section 6F.49	Double Reverse Curve Signs (W24-1 Series)	598
Section 6F.50	Other Warning Signs.....	598
Section 6F.51	Special Warning Signs	598
Section 6F.52	Advisory Speed Plaque (W13-1P)	598
Section 6F.53	Supplementary Distance Plaque (W7-3aP)	599
Section 6F.54	Motorcycle Plaque (W8-15P)	599
Section 6F.55	Guide Signs	599
Section 6F.56	ROAD WORK NEXT XX MILES Sign (G20-1)	599
Section 6F.57	END ROAD WORK Sign (G20-2).....	600
Section 6F.58	PILOT CAR FOLLOW ME Sign (G20-4).....	600
Section 6F.59	Detour Signs (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-9c, and M4-10)	600
Section 6F.60	Portable Changeable Message Signs	600
Section 6F.61	Arrow Boards	603
Section 6F.62	High-Level Warning Devices (Flag Trees)	605
Section 6F.63	Channelizing Devices	606
Section 6F.64	Cones.....	608
Section 6F.65	Tubular Markers	608
Section 6F.66	Vertical Panels.....	609
Section 6F.67	Drums	609

Rev. 3

Section 6F.68	Type 1, 2, or 3 Barricades	611
Section 6F.69	Direction Indicator Barricades	611
Section 6F.70	Temporary Traffic Barriers as Channelizing Devices	611
Section 6F.71	Longitudinal Channelizing Devices	611
Section 6F.72	Temporary Lane Separators	612
Section 6F.73	Other Channelizing Devices	612
Section 6F.74	Detectable Edging for Pedestrians	612
Section 6F.75	Temporary Raised Islands	613
Section 6F.76	Opposing Traffic Lane Divider and Sign (W6-4)	613
Section 6F.77	Pavement Markings	614
Section 6F.78	Temporary Markings	614
Section 6F.79	Temporary Raised Pavement Markers	615
Section 6F.80	Delineators	615
Section 6F.81	Lighting Devices	616
Section 6F.82	Floodlights	616
Section 6F.83	Warning Lights	616
Section 6F.84	Temporary Traffic Control Signals	617
Section 6F.85	Temporary Traffic Barriers	618
Section 6F.86	Crash Cushions	619
Section 6F.87	Rumble Strips	620
Section 6F.88	Screens	620

CHAPTER 6G TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES

Section 6G.01	Typical Applications	621
Section 6G.02	Work Duration	621
Section 6G.03	Location of Work	623
Section 6G.04	Modifications To Fulfill Special Needs	623
Section 6G.05	Work Affecting Pedestrian and Bicycle Facilities	624
Section 6G.06	Work Outside of the Shoulder	624
Section 6G.07	Work on the Shoulder with No Encroachment	625
Section 6G.08	Work on the Shoulder with Minor Encroachment	626
Section 6G.09	Work Within the Median	626
Section 6G.10	Work Within the Traveled Way of a Two-Lane Highway	626
Section 6G.11	Work Within the Traveled Way of an Urban Street	627
Section 6G.12	Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway	627
Section 6G.13	Work Within the Traveled Way at an Intersection	628
Section 6G.14	Work Within the Traveled Way of a Freeway or Expressway	629
Section 6G.15	Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway	630
Section 6G.16	Crossovers	630
Section 6G.17	Interchanges	630
Section 6G.18	Work in the Vicinity of a Grade Crossing	631
Section 6G.19	Temporary Traffic Control During Nighttime Hours	631

CHAPTER 6H TYPICAL APPLICATIONS

Section 6H.01	Typical Applications	633
---------------	----------------------------	-----

CHAPTER 6I CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS

Section 6I.01	General	728
Section 6I.02	Major Traffic Incidents	729
Section 6I.03	Intermediate Traffic Incidents	730
Section 6I.04	Minor Traffic Incidents	730
Section 6I.05	Use of Emergency-Vehicle Lighting	731

PART 7 TRAFFIC CONTROL FOR SCHOOL AREAS

CHAPTER 7A GENERAL

Section 7A.01	Need for Standards.....	733
Section 7A.02	School Routes and Established School Crossings	733
Section 7A.03	School Crossing Control Criteria	733
Section 7A.04	Scope	734

CHAPTER 7B SIGNS

Section 7B.01	Size of School Signs	735
Section 7B.02	Illumination and Reflectorization.....	736
Section 7B.03	Position of Signs	736
Section 7B.04	Height of Signs	736
Section 7B.05	Installation of Signs.....	736
Section 7B.06	Lettering.....	736
Section 7B.07	Sign Color for School Warning Signs	736
Section 7B.08	School Sign (S1-1) and Plaques	736
Section 7B.09	School Zone Sign (S1-1) and Plaques (S4-3P, S4-7P) and END SCHOOL ZONE Sign (S5-2).....	738
Section 7B.10	Higher Fines Zone Signs (R2-10, R2-11) and Plaques	738
Section 7B.11	School Advance Crossing Assembly	738
Section 7B.12	School Crossing Assembly	743
Section 7B.13	School Bus Stop Ahead Sign (S3-1)	744
Section 7B.14	SCHOOL BUS TURN AHEAD Sign (S3-2)	744
Section 7B.15	School Speed Limit Assembly (S4-1P, S4-2P, S4-3P, S4-4P, S4-6P, S5-1) and END SCHOOL SPEED LIMIT Sign (S5-3)	744
Section 7B.16	Reduced School Speed Limit Ahead Sign (S4-5, S4-5a).....	745
Section 7B.17	Parking and Stopping Signs (R7 and R8 Series)	745

Rev. 3

CHAPTER 7C MARKINGS

Section 7C.01	Functions and Limitations.....	746
Section 7C.02	Crosswalk Markings	746
Section 7C.03	Pavement Word, Symbol, and Arrow Markings.....	746

CHAPTER 7D CROSSING SUPERVISION

Section 7D.01	Types of Crossing Supervision	747
Section 7D.02	Adult Crossing Guards	747
Section 7D.03	Qualifications of Adult Crossing Guards	747
Section 7D.04	Uniform of Adult Crossing Guards	747
Section 7D.05	Operating Procedures for Adult Crossing Guards	747

PART 8 TRAFFIC CONTROL FOR RAILROAD AND LIGHT RAIL TRANSIT GRADE CROSSINGS

CHAPTER 8A GENERAL

Section 8A.01	Introduction	749
Section 8A.02	Use of Standard Devices, Systems, and Practices at Highway-Rail Grade Crossings	749
Section 8A.03	Use of Standard Devices, Systems, and Practices at Highway-LRT Grade Crossings	750
Section 8A.04	Uniform Provisions	751
Section 8A.05	Grade Crossing Elimination.....	751
Section 8A.06	Illumination at Grade Crossings	752
Section 8A.07	Quiet Zone Treatments at Highway-Rail Grade Crossings	752
Section 8A.08	Temporary Traffic Control Zones	752

CHAPTER 8B SIGNS AND MARKINGS

Section 8B.01	Purpose	753
Section 8B.02	Sizes of Grade Crossing Signs	753
Section 8B.03	Grade Crossing (Crossbuck) Sign (R15-1) and Number of Tracks Plaque (R15-2P) at Active and Passive Grade Crossings	753
Section 8B.04	Crossbuck Assemblies with YIELD or STOP Signs at Passive Grade Crossings	756
Section 8B.05	Use of STOP (R1-1) or YIELD (R1-2) Signs without Crossbuck Signs at Highway-LRT Grade Crossings	760
Section 8B.06	Grade Crossing Advance Warning Signs (W10 Series)	760
Section 8B.07	EXEMPT Grade Crossing Plaques (R15-3P, W10-1aP)	761
Section 8B.08	Turn Restrictions During Preemption	762
Section 8B.09	DO NOT STOP ON TRACKS Sign (R8-8)	762
Section 8B.10	TRACKS OUT OF SERVICE Sign (R8-9)	762
Section 8B.11	STOP HERE WHEN FLASHING Signs (R8-10, R8-10a)	763
Section 8B.12	STOP HERE ON RED Signs (R10-6, R10-6a)	763
Section 8B.13	Light Rail Transit Only Lane Signs (R15-4 Series)	763
Section 8B.14	Do Not Pass Light Rail Transit Signs (R15-5, R15-5a)	763
Section 8B.15	No Motor Vehicles On Tracks Signs (R15-6, R15-6a)	764
Section 8B.16	Divided Highway with Light Rail Transit Crossing Signs (R15-7 Series)	764
Section 8B.17	LOOK Sign (R15-8)	764
Section 8B.18	Emergency Notification Sign (I-13)	764
Section 8B.19	Light Rail Transit Approaching-Activated Blank-Out Warning Sign (W10-7)	765
Section 8B.20	TRAIN MAY EXCEED 80 MPH Sign (W10-8)	765
Section 8B.21	NO TRAIN HORN Sign or Plaque (W10-9, W10-9P)	765
Section 8B.22	NO GATES OR LIGHTS Plaque (W10-13P)	765
Section 8B.23	Low Ground Clearance Grade Crossing Sign (W10-5)	765
Section 8B.24	Storage Space Signs (W10-11, W10-11a, W10-11b)	766
Section 8B.25	Skewed Crossing Sign (W10-12)	766
Section 8B.26	Light Rail Transit Station Sign (I-12)	766
Section 8B.27	Pavement Markings	766
Section 8B.28	Stop and Yield Lines	768
Section 8B.29	Dynamic Envelope Markings	769

CHAPTER 8C FLASHING-LIGHT SIGNALS, GATES, AND TRAFFIC CONTROL SIGNALS

Section 8C.01	Introduction	771
Section 8C.02	Flashing-Light Signals	771
Section 8C.03	Flashing-Light Signals at Highway-LRT Grade Crossings	773
Section 8C.04	Automatic Gates	774
Section 8C.05	Use of Automatic Gates at LRT Grade Crossings	775
Section 8C.06	Four-Quadrant Gate Systems	775
Section 8C.07	Wayside Horn Systems	777
Section 8C.08	Rail Traffic Detection	777
Section 8C.09	Traffic Control Signals at or Near Highway-Rail Grade Crossings	778
Section 8C.10	Traffic Control Signals at or Near Highway-LRT Grade Crossings	779
Section 8C.11	Use of Traffic Control Signals for Control of LRT Vehicles at Grade Crossings	780
Section 8C.12	Grade Crossings Within or In Close Proximity to Circular Intersections	782
Section 8C.13	Pedestrian and Bicycle Signals and Crossings at LRT Grade Crossings	782

CHAPTER 8D PATHWAY GRADE CROSSINGS

Section 8D.01	Purpose	788
Section 8D.02	Use of Standard Devices, Systems, and Practices	788
Section 8D.03	Pathway Grade Crossing Signs and Markings	788
Section 8D.04	Stop Lines, Edge Lines, and Detectable Warnings	788
Section 8D.05	Passive Devices for Pathway Grade Crossings	789
Section 8D.06	Active Traffic Control Systems for Pathway Grade Crossings	790

PART 9 TRAFFIC CONTROL FOR BICYCLE FACILITIES**CHAPTER 9A GENERAL**

Section 9A.01	Requirements for Bicyclist Traffic Control Devices	791
Section 9A.02	Scope	791
Section 9A.03	Definitions Relating to Bicycles	791
Section 9A.04	Maintenance	791
Section 9A.05	Relation to Other Documents	791
Section 9A.06	Placement Authority	791
Section 9A.07	Meaning of Standard, Guidance, Option, and Support	791
Section 9A.08	Colors	791

CHAPTER 9B SIGNS

Section 9B.01	Application and Placement of Signs	792
Section 9B.02	Design of Bicycle Signs	792
Section 9B.03	STOP and YIELD Signs (R1-1, R1-2)	794
Section 9B.04	Bike Lane Signs and Plaques (R3-17, R3-17aP, R3-17bP)	796
Section 9B.05	BEGIN RIGHT TURN LANE YIELD TO BIKES Sign (R4-4)	796
Section 9B.06	Bicycles May Use Full Lane Sign (R4-11)	796
Section 9B.07	Bicycle WRONG WAY Sign and RIDE WITH TRAFFIC Plaque (R5-1b, R9-3cP)	796
Section 9B.08	NO MOTOR VEHICLES Sign (R5-3)	797
Section 9B.09	Selective Exclusion Signs	797
Section 9B.10	No Parking Bike Lane Signs (R7-9, R7-9a)	797
Section 9B.11	Bicycle Regulatory Signs (R9-5, R9-6, R10-4, R10-24, R10-25, and R10-26)	797
Section 9B.12	Shared-Use Path Restriction Sign (R9-7)	797
Section 9B.13	Bicycle Signal Actuation Sign (R10-22)	798
Section 9B.14	Other Regulatory Signs	798
Section 9B.15	Turn or Curve Warning Signs (W1 Series)	798
Section 9B.16	Intersection Warning Signs (W2 Series)	798
Section 9B.17	Bicycle Surface Condition Warning Sign (W8-10)	798
Section 9B.18	Bicycle Warning and Combined Bicycle/Pedestrian Signs (W11-1 and W11-15)	798
Section 9B.19	Other Bicycle Warning Signs	800
Section 9B.20	Bicycle Guide Signs (D1-1b, D1-1c, D1-2b, D1-2c, D1-3b, D1-3c, D11-1, D11-1c)	800
Section 9B.21	Bicycle Route Signs (M1-8, M1-8a, M1-9)	802
Section 9B.22	Bicycle Route Sign Auxiliary Plaques	804
Section 9B.23	Bicycle Parking Area Sign (D4-3)	806
Section 9B.24	Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a)	806
Section 9B.25	Mode-Specific Guide Signs for Shared-Use Paths (D11-1a, D11-2, D11-3, D11-4)	807
Section 9B.26	Object Markers	807

CHAPTER 9C MARKINGS

Section 9C.01	Functions of Markings	808
Section 9C.02	General Principles	808
Section 9C.03	Marking Patterns and Colors on Shared-Use Paths	808
Section 9C.04	Markings For Bicycle Lanes	808
Section 9C.05	Bicycle Detector Symbol	812
Section 9C.06	Pavement Markings for Obstructions	812
Section 9C.07	Shared Lane Marking	812

CHAPTER 9D SIGNALS

Section 9D.01	Application	818
Section 9D.02	Signal Operations for Bicycles	818

APPENDIX A1. CONGRESSIONAL LEGISLATION	A1-1
APPENDIX A2. METRIC CONVERSIONS	A2-1

FIGURES

Page

Figure 1A-1	Process for Requesting and Conducting Experimentations for New Traffic Control Devices ...	5
Figure 1A-2	Process for Incorporating New Traffic Control Devices into the MUTCD	8
Figure 2A-1	Examples of Enhanced Conspicuity for Signs	37
Figure 2A-2	Examples of Heights and Lateral Locations of Sign Installations	38
Figure 2A-3	Examples of Locations for Some Typical Signs at Intersections.....	39
Figure 2A-4	Relative Locations of Regulatory, Warning, and Guide Signs on an Intersection Approach ..	40
Figure 2B-1	STOP and YIELD Signs and Plaques	51
Figure 2B-2	Unsignalized Pedestrian Crosswalk Signs	55
Figure 2B-3	Speed Limit and Photo Enforcement Signs and Plaques.....	57
Figure 2B-4	Movement Prohibition and Lane Control Signs and Plaques	60
Figure 2B-5	Intersection Lane Control Sign Arrow Options for Roundabouts	62
Figure 2B-6	Center and Reversible Lane Control Signs and Plaques.....	65
Figure 2B-7	Location of Reversible Two-Way Left-Turn Signs.....	66
Figure 2B-8	Jughandle Regulatory Signs	68
Figure 2B-9	Examples of Applications of Jughandle Regulatory and Guide Signing.....	69
Figure 2B-10	Passing, Keep Right, and Slow Traffic Signs	72
Figure 2B-11	Selective Exclusion Signs	75
Figure 2B-12	Locations of Wrong-Way Signing for Divided Highways with Median Widths of 30 Feet or Wider	76
Figure 2B-13	ONE WAY and Divided Highway Crossing Signs.....	78
Figure 2B-14	Locations of ONE WAY Signs.....	79
Figure 2B-15	ONE WAY Signing for Divided Highways with Median Widths of 30 Feet or Wider	80
Figure 2B-16	ONE WAY Signing for Divided Highways with Median Widths Narrower Than 30 Feet	81
Figure 2B-17	ONE WAY Signing for Divided Highways with Median Widths Narrower Than 30 Feet and Separated Left-Turn Lanes	82
Figure 2B-18	Example of Application of Regulatory Signing and Pavement Markings at an Exit Ramp Termination to Deter Wrong-Way Entry	83
Figure 2B-19	Example of Application of Regulatory Signing and Pavement Markings at an Entrance Ramp Terminal Where the Design Does Not Clearly Indicate the Direction of Flow	83
Figure 2B-20	Roundabout Signs and Plaques	84
Figure 2B-21	Example of Regulatory and Warning Signs for a Mini-Roundabout	85
Figure 2B-22	Example of Regulatory and Warning Signs for a One-Lane Roundabout	86
Figure 2B-23	Example of Regulatory and Warning Signs for a Two-Lane Roundabout with Consecutive Double Lefts	87
Figure 2B-24	Parking and Standing Signs and Plaques (R7 Series)	88
Figure 2B-25	Parking and Stopping Signs and Plaques (R8 Series)	90
Figure 2B-26	Pedestrian Signs and Plaques	93
Figure 2B-27	Traffic Signal Signs and Plaques	96
Figure 2B-28	Ramp Metering Signs.....	97
Figure 2B-29	Road Closed and Weight Limit Signs	98
Figure 2B-30	Truck Signs	99
Figure 2B-31	Headlight Use Signs	100
Figure 2B-32	Other Regulatory Signs and Symbols	101
Figure 2C-1	Horizontal Alignment Signs and Plaques	109
Figure 2C-2	Example of Warning Signs for a Turn.....	111
Figure 2C-3	Example of Advisory Speed Signing for an Exit Ramp.....	116
Figure 2C-4	Vertical Grade Signs and Plaques	117
Figure 2C-5	Miscellaneous Warning Signs	118

Figure 2C-6	Roadway and Weather Condition and Advance Traffic Control Signs and Plaques.....	121
Figure 2C-7	Reduced Speed Limit Ahead Signs.....	124
Figure 2C-8	Merging and Passing Signs and Plaques	125
Figure 2C-9	Intersection Warning Signs and Plaques	127
Figure 2C-10	Vehicular Traffic Warning Signs and Plaques.....	129
Figure 2C-11	Non-Vehicular Warning Signs.....	130
Figure 2C-12	Supplemental Warning Plaques	132
Figure 2C-13	Object Markers.....	135
Figure 2D-1	Examples of Color-Coded Destination Guide Signs	138
Figure 2D-2	Arrows for Use on Guide Signs.....	141
Figure 2D-3	Route Signs	143
Figure 2D-4	Route Sign Auxiliaries	145
Figure 2D-5	Advance Turn and Directional Arrow Auxiliary Signs	147
Figure 2D-6	Illustration of Directional Assemblies and Other Route Signs (for One Direction of Travel Only).....	149
Figure 2D-7	Destination and Distance Signs.....	155
Figure 2D-8	Destination Signs for Roundabouts	158
Figure 2D-9	Examples of Guide Signs for Roundabouts	159
Figure 2D-10	Street Name and Parking Signs.....	162
Figure 2D-11	Example of Interchange Crossroad Signing for a One-Lane Approach	165
Figure 2D-12	Example of Minor Interchange Crossroad Signing	166
Figure 2D-13	Examples of Multi-Lane Crossroad Signing for a Diamond Interchange	167
Figure 2D-14	Examples of Multi-Lane Crossroad Signing for a Partial Cloverleaf Interchange	168
Figure 2D-15	Examples of Multi-Lane Crossroad Signing for a Cloverleaf Interchange	169
Figure 2D-16	Example of Crossroad Signing for an Entrance Ramp with a Nearby Frontage Road.....	170
Figure 2D-17	Example of Weigh Station Signing	173
Figure 2D-18	Examples of Community Wayfinding Guide Signs.....	174
Figure 2D-19	Example of a Community Wayfinding Guide Sign System Showing Direction from a Freeway or Expressway	175
Figure 2D-20	Example of a Color-Coded Community Wayfinding Guide Sign System.....	176
Figure 2D-21	Crossover, Truck Lane, and Slow Vehicle Signs	178
Figure 2D-22	Examples of Use of the National Scenic Byways Sign	180
Figure 2E-1	Example of Guide Sign Spreading	184
Figure 2E-2	Pull-Through Signs	184
Figure 2E-3	Overhead Arrow-per-Lane Guide Sign for a Multi-Lane Exit with an Option Lane	194
Figure 2E-4	Overhead Arrow-per-Lane Guide Signs for a Two-Lane Exit to the Right with an Option Lane	195
Figure 2E-5	Overhead Arrow-per-Lane Guide Signs for a Two-Lane Exit to the Right with an Option Lane (Through Lanes Curve to the Left)	196
Figure 2E-6	Overhead Arrow-per-Lane Guide Signs for a Split with an Option Lane	197
Figure 2E-7	Diagrammatic Guide Sign for a Multi-Lane Exit with an Option Lane	199
Figure 2E-8	Diagrammatic Guide Signs for a Two-Lane Exit to the Right with an Option Lane	200
Figure 2E-9	Diagrammatic Guide Signs for a Two-Lane Exit to the Right with an Option Lane (Through Lanes Curve to the Left)	201
Figure 2E-10	Diagrammatic Guide Signs for a Split with an Option Lane	202
Figure 2E-11	Example of Signing for a Two-Lane Intermediate or Minor Interchange Exit with an Option Lane and a Dropped Lane	204
Figure 2E-12	Example of Signing for a Two-Lane Intermediate or Minor Interchange Exit with Option and Auxiliary Lanes.....	205
Figure 2E-13	EXIT ONLY and LEFT Sign Panels.....	206
Figure 2E-14	Guide Signs for a Split with Dedicated Lanes.....	207
Figure 2E-15	Guide Signs for a Single-Lane Exit to the Left with a Dropped Lane	208
Figure 2E-16	Guide Signs for a Single-Lane Exit to the Right with a Dropped Lane	209
Figure 2E-17	Interstate, Off-Interstate, and U.S. Route Signs.....	210

Figure 2E-18	Eisenhower Interstate System Signs	211
Figure 2E-19	Example of Interchange Numbering for Mainline and Circumferential Routes	213
Figure 2E-20	Example of Interchange Numbering for Mainline, Loop, and Spur Routes	214
Figure 2E-21	Example of Interchange Numbering for Overlapping Routes	215
Figure 2E-22	Examples of Interchange Advance Guide Signs, Exit Number Plaques, and LEFT Plaque	217
Figure 2E-23	Next Exit Plaques	218
Figure 2E-24	Supplemental Guide Sign for a Multi-Exit Interchange	219
Figure 2E-25	Supplemental Guide Sign for a Park – Ride Facility	219
Figure 2E-26	Examples of Interchange Exit Direction Signs	220
Figure 2E-27	Interchange Exit Direction Sign with an Advisory Speed Panel	221
Figure 2E-28	Exit Gore Signs	222
Figure 2E-29	Post-Interchange Distance Sign	223
Figure 2E-30	Example of Using an Interchange Sequence Sign for Closely-Spaced Interchanges	224
Figure 2E-31	Interchange Sequence Sign	225
Figure 2E-32	Community Interchanges Identification Sign	225
Figure 2E-33	NEXT EXITS Sign	225
Figure 2E-34	Examples of Guide Signs for a Freeway-to-Freeway Interchange	227
Figure 2E-35	Examples of Guide Signs for a Full Cloverleaf Interchange	229
Figure 2E-36	Examples of Guide Signs for a Full Cloverleaf Interchange with Collector-Distributor Roadways	231
Figure 2E-37	Examples of Guide Signs for a Partial Cloverleaf Interchange	232
Figure 2E-38	Examples of Guide Signs for a Diamond Interchange	233
Figure 2E-39	Examples of Guide Signs for a Diamond Interchange in an Urban Area	235
Figure 2E-40	Examples of Guide Signs for a Minor Interchange	236
Figure 2F-1	Examples of ETC Account Pictographs and Use of Purple Backgrounds and Underlay Panels	239
Figure 2F-2	Toll Plaza Regulatory Signs and Plaques	240
Figure 2F-3	Toll Plaza Warning Signs and Plaques	241
Figure 2F-4	ETC Account-Only Auxiliary Signs for Use in Route Sign Assemblies	243
Figure 2F-5	Examples of Guide Signs for Entrances to Toll Highways or Ramps	245
Figure 2F-6	Examples of Guide Signs for the Entrance to a Toll Highway on which Tolls are Collected Electronically Only	246
Figure 2F-7	Examples of Guide Signs for Alternative Toll and Non-Toll Ramp Connections to a Non-Toll Highway	247
Figure 2F-8	Examples of Conventional Toll Plaza Advance Signs	248
Figure 2F-9	Examples of Toll Plaza Canopy Signs	248
Figure 2F-10	Examples of Mainline Toll Plaza Approach and Canopy Signing	250
Figure 2F-11	Examples of Guide Signs for a Mainline Toll Plaza on a Diverging Alignment from Open-Road ETC Lanes	251
Figure 2G-1	Preferential Lane Regulatory Signs and Plaques	255
Figure 2G-2	Example of Signing for an Added Continuous-Access Contiguous or Buffer-Separated HOV Lane	261
Figure 2G-3	Example of Signing for a General-Purpose Lane that Becomes a Continuous-Access Contiguous or Buffer-Separated HOV Lane	262
Figure 2G-4	Examples of Warning Signs and Plaques Applicable Only to Preferential Lanes	264
Figure 2G-5	Example of an Overhead Advance Guide Sign for a Preferential Lane Entrance	267
Figure 2G-6	Examples of Overhead or Post-Mounted Preferential Lane Entrance Direction Signs	267
Figure 2G-7	Entrance Gore Signs for Barrier-Separated Preferential Lanes	268
Figure 2G-8	Example of Signing for an Entrance to Access-Restricted HOV Lanes	269
Figure 2G-9	Example of Signing for an Intermediate Entry to a Barrier- or Buffer-Separated HOV Lane	271
Figure 2G-10	Example of Signing for the Intermediate Entry to, Egress from, and End of Access-Restricted HOV Lanes	272

Figure 2G-11	Examples of Barrier-Mounted Guide Signs for an Intermediate Egress from Preferential Lanes	273
Figure 2G-12	Examples of Guide Signs for an Intermediate Egress from a Barrier- or Buffer-Separated HOV Lane	274
Figure 2G-13	Example of Signing for a Direct Entrance Ramp to an HOV Lane from a Park-and-Ride Facility and a Local Street	275
Figure 2G-14	Exit Gore Sign for a Direct Exit from a Preferential Lane.....	276
Figure 2G-15	Examples of Guide Signs for Direct HOV Lane Entrance and Exit Ramps	277
Figure 2G-16	Examples of Guide Signs for a Direct Access Ramp between HOV Lanes on Separate Freeways.....	278
Figure 2G-17	Regulatory Signs for Managed Lanes	280
Figure 2G-18	Examples of Guide Signs for Entrances to Priced Managed Lanes	281
Figure 2G-19	Example of an Exit Destinations Sign for a Managed Lane	282
Figure 2G-20	Example of a Comparative Travel Time Information Sign for Preferential or Managed Lanes	282
Figure 2G-21	Example of Signing for the Entrance to an Access-Restricted Priced Managed Lane	283
Figure 2G-22	Example of Signing for the Entrance to an Access-Restricted Priced Managed Lane Where a General-Purpose Lane Becomes the Managed Lane.....	284
Figure 2G-23	Example of Signing for an Intermediate Entry to a Barrier- or Buffer-Separated Priced Managed Lane.....	285
Figure 2G-24	Example of Signing for the Intermediate Entry to, Egress from, and End of Access-Restricted Priced Managed Lanes.....	286
Figure 2G-25	Examples of Guide Signs for an Intermediate Egress from a Barrier- or Buffer-Separated HOV Lane	287
Figure 2G-26	Examples of Guide Signs for Direct Managed Lane Entrance and Exit Ramps	288
Figure 2G-27	Examples of Guide Signs for a Direct Access Ramp between Managed Lanes on Separate Freeways.....	289
Figure 2G-28	Examples of Guide Signs for a Direct Entrance Ramp to a Priced Managed Lane and Trailblazing to a Nearby Entrance to the General-Purpose Lanes.....	290
Figure 2G-29	Examples of Guide Signs for Separate Entrance Ramps to General-Purpose and Priced Managed Lanes from the Same Crossroad	291
Figure 2H-1	General Information and Miscellaneous Information Signs	293
Figure 2H-2	Reference Location Signs.....	295
Figure 2H-3	Intermediate Reference Location Signs	295
Figure 2H-4	Enhanced Reference Location Signs	296
Figure 2H-5	Examples of Acknowledgment Sign Designs	298
Figure 2I-1	General Service Signs and Plaques	301
Figure 2I-2	Example of Next Services Plaque	302
Figure 2I-3	Examples of General Service Signs with and without Exit Numbering.....	304
Figure 2I-4	Examples of Interstate Oasis Signs and Plaques	306
Figure 2I-5	Rest Area and Other Roadside Area Signs.....	307
Figure 2I-6	Brake Check Area and Chain-Up Area Signs	308
Figure 2I-7	Examples of Tourist Information and Welcome Center Signs	309
Figure 2I-8	Radio, Telephone, and Carpool Information Signs	310
Figure 2J-1	Examples of Specific Service Signs	314
Figure 2J-2	Examples of Specific Service Sign Locations	315
Figure 2J-3	Examples of Supplemental Messages on Logo Sign Panels	316
Figure 2J-4	Examples of RV Access Supplemental Messages on Logo Sign Panels	316
Figure 2J-5	Examples of Specific Service Trailblazer Signs.....	319
Figure 2K-1	Examples of Tourist-Oriented Directional Signs	321
Figure 2K-2	Examples of Intersection Approach Signs and Advance Signs for Tourist-Oriented Directional Signs.....	322
Figure 2M-1	Examples of Use of Arrows, Educational Plaques, and Prohibitory Slashes.....	333

Figure 2M-2	Examples of Recreational and Cultural Interest Area Guide Signs	334
Figure 2M-3	Arrangement, Height, and Lateral Position of Signs Located Within Recreational and Cultural Interest Areas	335
Figure 2M-4	Examples of Symbol and Destination Guide Signing Layout	336
Figure 2M-5	Recreational and Cultural Interest Area Symbol Signs for General Applications	337
Figure 2M-6	Recreational and Cultural Interest Area Symbol Signs for Accommodations	338
Figure 2M-7	Recreational and Cultural Interest Area Symbol Signs for Services.....	338
Figure 2M-8	Recreational and Cultural Interest Area Symbol Signs for Land Recreation.....	339
Figure 2M-9	Recreational and Cultural Interest Area Symbol Signs for Water Recreation	340
Figure 2M-10	Recreational and Cultural Interest Area Symbol Signs for Winter Recreation	341
Figure 2N-1	Emergency Management Signs	343
Figure 3B-1	Examples of Two-Lane, Two-Way Marking Applications	351
Figure 3B-2	Examples of Four-or-More Lane, Two-Way Marking Applications	352
Figure 3B-3	Examples of Three-Lane, Two-Way Marking Applications.....	353
Figure 3B-4	Method of Locating and Determining the Limits of No-Passing Zones at Curves	354
Figure 3B-5	Example of Application of Three-Lane, Two-Way Marking for Changing Direction of the Center Lane	355
Figure 3B-6	Example of Reversible Lane Marking Application	357
Figure 3B-7	Example of Two-Way Left-Turn Lane Marking Applications	358
Figure 3B-8	Examples of Dotted Line and Channelizing Line Applications for Exit Ramp Markings....	359
Figure 3B-9	Examples of Dotted Line and Channelizing Line Applications for Entrance Ramp Markings	361
Figure 3B-10	Examples of Applications of Freeway and Expressway Lane-Drop Markings	364
Figure 3B-11	Examples of Applications of Conventional Road Lane-Drop Markings	369
Figure 3B-12	Example of Solid Double White Lines Used to Prohibit Lane Changing	371
Figure 3B-13	Examples of Line Extensions through Intersections	373
Figure 3B-14	Examples of Applications of Lane-Reduction Transition Markings	376
Figure 3B-15	Examples of Applications of Markings for Obstructions in the Roadway	378
Figure 3B-16	Recommended Yield Line Layouts	383
Figure 3B-17	Examples of Yield Lines at Unsignalized Midblock Crosswalks.....	384
Figure 3B-18	Do Not Block Intersection Markings	385
Figure 3B-19	Examples of Crosswalk Markings.....	385
Figure 3B-20	Example of Crosswalk Markings for an Exclusive Pedestrian Phase that Permits Diagonal Crossing	386
Figure 3B-21	Examples of Parking Space Markings	387
Figure 3B-22	International Symbol of Accessibility Parking Space Marking	388
Figure 3B-23	Example of Elongated Letters for Word Pavement Markings	388
Figure 3B-24	Examples of Standard Arrows for Pavement Markings	389
Figure 3B-25	Examples of Elongated Route Shields for Pavement Markings	391
Figure 3B-26	Yield Ahead Triangle Symbols	392
Figure 3B-27	Examples of Lane-Use Control Word and Arrow Pavement Markings	393
Figure 3B-28	Example of the Application of Speed Reduction Markings	395
Figure 3B-29	Pavement Markings for Speed Humps without Crosswalks.....	397
Figure 3B-30	Pavement Markings for Speed Tables or Speed Humps with Crosswalks	398
Figure 3B-31	Advance Warning Markings for Speed Humps	399
Figure 3C-1	Example of Markings for Approach and Circulatory Roadways at a Roundabout	400
Figure 3C-2	Lane-Use Arrow Pavement Marking Options for Roundabout Approaches	401
Figure 3C-3	Example of Markings for a One-Lane Roundabout	401
Figure 3C-4	Example of Markings for a Two-Lane Roundabout with One- and Two-Lane Approaches...	402
Figure 3C-5	Example of Markings for a Two-Lane Roundabout with One-Lane Exits.....	404
Figure 3C-6	Example of Markings for a Two-Lane Roundabout with Two-Lane Exits.....	405
Figure 3C-7	Example of Markings for a Two-Lane Roundabout with a Double Left Turn	406
Figure 3C-8	Example of Markings for a Two-Lane Roundabout with a Double Right Turn	407
Figure 3C-9	Example of Markings for a Two-Lane Roundabout with Consecutive Double Lefts.....	408

Figure 3C-10	Example of Markings for a Three-Lane Roundabout with Two- and Three-Lane Approaches.....	409
Figure 3C-11	Example of Markings for a Three-Lane Roundabout with Three-Lane Approaches	410
Figure 3C-12	Example of Markings for a Three-Lane Roundabout with Two-Lane Exits.....	411
Figure 3C-13	Example of Markings for Two Linked Roundabouts	412
Figure 3C-14	Example of Markings for a Diamond Interchange with Two Circular-Shaped Roundabout Ramp Terminals	413
Figure 3D-1	Markings for Barrier-Separated Preferential Lanes	419
Figure 3D-2	Markings for Buffer-Separated Preferential Lanes	419
Figure 3D-3	Markings for Contiguous Preferential Lanes	421
Figure 3D-4	Markings for Counter-Flow Preferential Lanes on Divided Highways	423
Figure 3F-1	Examples of Delineator Placement	426
Figure 3J-1	Examples of Longitudinal Rumble Strip Markings	433
Figure 4C-1	Warrant 2, Four-Hour Vehicular Volume	442
Figure 4C-2	Warrant 2, Four-Hour Vehicular Volume (70% Factor)	442
Figure 4C-3	Warrant 3, Peak Hour	443
Figure 4C-4	Warrant 3, Peak Hour (70% Factor)	443
Figure 4C-5	Warrant 4, Pedestrian Four-Hour Volume	445
Figure 4C-6	Warrant 4, Pedestrian Four-Hour Volume (70% Factor)	445
Figure 4C-7	Warrant 4, Pedestrian Peak Hour	446
Figure 4C-8	Warrant 4, Pedestrian Peak Hour (70% Factor)	446
Figure 4C-9	Warrant 9, Intersection Near a Grade Crossing (One Approach Lane at the Track Crossing)	449
Figure 4C-10	Warrant 9, Intersection Near a Grade Crossing (Two or More Approach Lanes at the Track Crossing)	449
Figure 4D-1	Example of U-Turn Signal Face	458
Figure 4D-2	Typical Arrangements of Signal Sections in Signal Faces That Do Not Control Turning Movements	460
Figure 4D-3	Recommended Vehicular Signal Faces for Approaches with Posted, Statutory, or 85 th Percentile Speed of 45 mph or Higher	462
Figure 4D-4	Lateral and Longitudinal Location of Primary Signal Faces	465
Figure 4D-5	Maximum Mounting Height of Signal Faces Located Between 40 Feet and 53 Feet from Stop Line	467
Figure 4D-6	Typical Position and Arrangements of Shared Signal Faces for Permissive Only Mode Left Turns	469
Figure 4D-7	Typical Position and Arrangements of Separate Signal Faces with Flashing Yellow Arrow for Permissive Only Mode Left Turns	470
Figure 4D-8	Typical Position and Arrangements of Separate Signal Faces with Flashing Red Arrow for Permissive Only Mode and Protected/Permissive Mode Left Turns	471
Figure 4D-9	Typical Positions and Arrangements of Shared Signal Faces for Protected Only Mode Left Turns	472
Figure 4D-10	Typical Position and Arrangements of Separate Signal Faces for Protected Only Mode Left Turns	473
Figure 4D-11	Typical Position and Arrangements of Shared Signal Faces for Protected/Permissive Mode Left Turns	474
Figure 4D-12	Typical Position and Arrangements of Separate Signal Faces with Flashing Yellow Arrow for Protected/Permissive Mode and Protected Only Mode Left Turns	475
Figure 4D-13	Typical Positions and Arrangements of Shared Signal Faces for Permissive Only Mode Right Turns	478
Figure 4D-14	Typical Position and Arrangements of Separate Signal Faces with Flashing Yellow Arrow for Permissive Only Mode Right Turns	479
Figure 4D-15	Typical Position and Arrangements of Separate Signal Faces with Flashing Red Arrow for Permissive Only Mode and Protected/Permissive Mode Right Turns	480

Figure 4D-16	Typical Positions and Arrangements of Shared Signal Faces for Protected Only Mode Right Turns	481
Figure 4D-17	Typical Position and Arrangements of Separate Signal Faces for Protected Only Mode Right Turns.....	482
Figure 4D-18	Typical Positions and Arrangements of Shared Signal Faces for Protected/Permissive Mode Right Turns	483
Figure 4D-19	Typical Position and Arrangements of Separate Signal Faces with Flashing Yellow Arrow for Protected/Permissive Mode and Protected Only Mode Right Turns	484
Figure 4D-20	Signal Indications for Approaches with a Shared Left-Turn/Right-Turn Lane and No Through Movement	488
Figure 4E-1	Typical Pedestrian Signal Indications	498
Figure 4E-2	Pedestrian Intervals	500
Figure 4E-3	Pushbutton Location Area.....	503
Figure 4E-4	Typical Pushbutton Locations	504
Figure 4F-1	Guidelines for the Installation of Pedestrian Hybrid Beacons on Low-Speed Roadways	512
Figure 4F-2	Guidelines for the Installation of Pedestrian Hybrid Beacons on High-Speed Roadways	512
Figure 4F-3	Sequence for a Pedestrian Hybrid Beacon	513
Figure 4G-1	Sequence for an Emergency-Vehicle Hybrid Beacon	517
Figure 4M-1	Left-Turn Lane-Use Control Signals	528
Figure 5B-1	Regulatory Signs on Low-Volume Roads	536
Figure 5B-2	Parking Signs and Plaques on Low-Volume Roads	537
Figure 5C-1	Horizontal Alignment and Intersection Warning Signs and Plaques and Object Markers on Low-Volume Roads	538
Figure 5C-2	Other Warning Signs and Plaques on Low-Volume Roads	540
Figure 5F-1	Highway-Rail Grade Crossing Signs and Plaques for Low-Volume Roads.....	544
Figure 5G-1	Temporary Traffic Control Signs and Plaques on Low-Volume Roads	547
Figure 6C-1	Component Parts of a Temporary Traffic Control Zone	555
Figure 6C-2	Types of Tapers and Buffer Spaces	558
Figure 6C-3	Example of a One-Lane, Two-Way Traffic Taper.....	561
Figure 6E-1	Example of the Use of a STOP/SLOW Automated Flagger Assistance Device (AFAD).....	572
Figure 6E-2	Example of the Use of a Red/Yellow Lens Automated Flagger Assistance Device (AFAD)..	574
Figure 6E-3	Use of Hand-Signaling Devices by Flaggers.....	576
Figure 6F-1	Height and Lateral Location of Signs—Typical Installations	583
Figure 6F-2	Methods of Mounting Signs Other Than on Posts	584
Figure 6F-3	Regulatory Signs and Plaques in Temporary Traffic Control Zones.....	586
Figure 6F-4	Warning Signs and Plaques in Temporary Traffic Control Zones.....	590
Figure 6F-5	Exit Open and Closed and Detour Signs	594
Figure 6F-6	Advance Warning Arrow Board Display Specifications	604
Figure 6F-7	Channelizing Devices	607
Figure 6H-1	Work Beyond the Shoulder (TA-1)	637
Figure 6H-2	Blasting Zone (TA-2)	639
Figure 6H-3	Work on the Shoulders (TA-3)	641
Figure 6H-4	Short-Duration or Mobile Operation on a Shoulder (TA-4)	643
Figure 6H-5	Shoulder Closure on a Freeway (TA-5)	645
Figure 6H-6	Shoulder Work with Minor Encroachment (TA-6)	647
Figure 6H-7	Road Closure with a Diversion (TA-7)	649
Figure 6H-8	Road Closure with an Off-Site Detour (TA-8)	651
Figure 6H-9	Overlapping Routes with a Detour (TA-9)	653
Figure 6H-10	Lane Closure on a Two-Lane Road Using Flaggers (TA-10)	655
Figure 6H-11	Lane Closure on a Two-Lane Road with Low Traffic Volumes (TA-11).....	657
Figure 6H-12	Lane Closure on a Two-Lane Road Using Traffic Control Signals (TA-12).....	659
Figure 6H-13	Temporary Road Closure (TA-13)	661
Figure 6H-14	Haul Road Crossing (TA-14)	663
Figure 6H-15	Work in the Center of a Road with Low Traffic Volumes (TA-15)	665

Figure 6H-16	Surveying Along the Center Line of a Road with Low Traffic Volumes (TA-16).....	667
Figure 6H-17	Mobile Operations on a Two-Lane Road (TA-17).....	669
Figure 6H-18	Lane Closure on a Minor Street (TA-18).....	671
Figure 6H-19	Detour for One Travel Direction (TA-19).....	673
Figure 6H-20	Detour for a Closed Street (TA-20)	675
Figure 6H-21	Lane Closure on the Near Side of an Intersection (TA-21)	677
Figure 6H-22	Right-Hand Lane Closure on the Far Side of an Intersection (TA-22).....	679
Figure 6H-23	Left-Hand Lane Closure on the Far Side of an Intersection (TA-23).....	681
Figure 6H-24	Half Road Closure on the Far Side of an Intersection (TA-24)	683
Figure 6H-25	Multiple Lane Closures at an Intersection (TA-25).....	685
Figure 6H-26	Closure in the Center of an Intersection (TA-26).....	687
Figure 6H-27	Closure at the Side of an Intersection (TA-27).....	689
Figure 6H-28	Sidewalk Detour or Diversion (TA-28)	691
Figure 6H-29	Crosswalk Closures and Pedestrian Detours (TA-29)	693
Figure 6H-30	Interior Lane Closure on a Multi-Lane Street (TA-30)	695
Figure 6H-31	Lane Closures on a Street with Uneven Directional Volumes (TA-31)	697
Figure 6H-32	Half Road Closure on a Multi-Lane, High-Speed Highway (TA-32)	699
Figure 6H-33	Stationary Lane Closure on a Divided Highway (TA-33)	701
Figure 6H-34	Lane Closure with a Temporary Traffic Barrier (TA-34)	703
Figure 6H-35	Mobile Operation on a Multi-Lane Road (TA-35)	705
Figure 6H-36	Lane Shift on a Freeway (TA-36).....	707
Figure 6H-37	Double Lane Closure on a Freeway (TA-37).....	709
Figure 6H-38	Interior Lane Closure on a Freeway (TA-38)	711
Figure 6H-39	Median Crossover on a Freeway (TA-39)	713
Figure 6H-40	Median Crossover for an Entrance Ramp (TA-40)	715
Figure 6H-41	Median Crossover for an Exit Ramp (TA-41)	717
Figure 6H-42	Work in the Vicinity of an Exit Ramp (TA-42)	719
Figure 6H-43	Partial Exit Ramp Closure (TA-43)	721
Figure 6H-44	Work in the Vicinity of an Entrance Ramp (TA-44).....	723
Figure 6H-45	Temporary Reversible Lane Using Movable Barriers (TA-45)	725
Figure 6H-46	Work in the Vicinity of a Grade Crossing (TA-46).....	727
Figure 6I-1	Examples of Traffic Incident Management Area Signs	729
Figure 7A-1	Example of School Route Plan Map.....	734
Figure 7B-1	School Area Signs	737
Figure 7B-2	Example of Signing for a Higher Fines School Zone without a School Crossing	739
Figure 7B-3	Example of Signing for a Higher Fines School Zone with a School Speed Limit	740
Figure 7B-4	Example of Signing for a School Crossing Outside of a School Zone	741
Figure 7B-5	Example of Signing for a School Zone with a School Speed Limit and a School Crossing ..	742
Figure 7B-6	In-Street Signs in School Areas	743
Figure 7C-1	Two-Lane Pavement Marking of "SCHOOL"	746
Figure 8B-1	Regulatory Signs and Plaques for Grade Crossings	755
Figure 8B-2	Crossbuck Assembly with a YIELD or STOP Sign on the Crossbuck Sign Support	756
Figure 8B-3	Crossbuck Assembly with a YIELD or STOP Sign on a Separate Sign Support	757
Figure 8B-4	Warning Signs and Plaques for Grade Crossings	761
Figure 8B-5	Example of an Emergency Notification Sign	763
Figure 8B-6	Example of Placement of Warning Signs and Pavement Markings at Grade Crossings	767
Figure 8B-7	Grade Crossing Pavement Markings	768
Figure 8B-8	Example of Dynamic Envelope Pavement Markings at Grade Crossings	769
Figure 8B-9	Examples of Light Rail Transit Vehicle Dynamic Envelope Markings for Mixed-Use Alignments	770
Figure 8C-1	Composite Drawing of Active Traffic Control Devices for Grade Crossings Showing Clearances	772
Figure 8C-2	Example of Location Plan for Flashing-Light Signals and Four-Quadrant Gates.....	776
Figure 8C-3	Light Rail Transit Signals.....	781

Rev. 3	<p>Figure 8C-4 Example of Flashing-Light Signal Assembly for Pedestrian Crossings 783</p> <p>Figure 8C-5 Example of a Shared Pedestrian/Roadway Gate 784</p> <p>Figure 8C-6 Example of a Separate Pedestrian Gate 784</p> <p>Figure 8C-7 Examples of Placement of Pedestrian Gates 785</p> <p>Figure 8C-8 Example of Swing Gates 786</p> <p>Figure 8C-9 Example of Pedestrian Barriers at an Offset Grade Crossing 786</p> <p>Figure 8C-10 Examples of Pedestrian Barrier Installation at an Offset Non-Intersection Grade Crossing... 787</p> <p>Figure 8D-1 Example of Signing and Markings for a Pathway Grade Crossing 789</p> <p>Figure 9B-1 Sign Placement on Shared-Use Paths 792</p> <p>Figure 9B-2 Regulatory Signs and Plaques for Bicycle Facilities 795</p> <p>Figure 9B-3 Warning Signs and Plaques and Object Markers for Bicycle Facilities 799</p> <p>Figure 9B-4 Guide Signs and Plaques for Bicycle Facilities 801</p> <p>Figure 9B-5 Example of Signing for the Beginning and End of a Designated Bicycle Route on a Shared-Use Path 803</p> <p>Figure 9B-6 Example of Bicycle Guide Signing 804</p> <p>Figure 9B-7 Examples of Signing and Markings for a Shared-Use Path Crossing 805</p> <p>Figure 9B-8 Example of Mode-Specific Guide Signing on a Shared-Use Path 807</p> <p>Figure 9C-1 Example of Intersection Pavement Markings—Designated Bicycle Lane with Left-Turn Area, Heavy Turn Volumes, Parking, One-Way Traffic, or Divided Highway 809</p> <p>Figure 9C-2 Examples of Center Line Markings for Shared-Use Paths 810</p> <p>Figure 9C-3 Word, Symbol, and Arrow Pavement Markings for Bicycle Lanes 811</p> <p>Figure 9C-4 Example of Bicycle Lane Treatment at a Right Turn Only Lane 813</p> <p>Figure 9C-5 Example of Bicycle Lane Treatment at Parking Lane into a Right Turn Only Lane 814</p> <p>Figure 9C-6 Example of Pavement Markings for Bicycle Lanes on a Two-Way Street..... 815</p> <p>Figure 9C-7 Bicycle Detector Pavement Marking 816</p> <p>Figure 9C-8 Examples of Obstruction Pavement Markings 817</p> <p>Figure 9C-9 Shared Lane Marking 817</p>
--------	--

TABLES

Page

Table I-1 Evolution of the MUTCD.....	I-2
Table I-2 Target Compliance Dates Established by the FHWA	I-4
Table 1A-1 Acceptable Abbreviations	24
Table 1A-2 Abbreviations that Shall be Used Only on Portable Changeable Message Signs.....	25
Table 1A-3 Unacceptable Abbreviations.....	26
Table 2A-1 Illumination of Sign Elements.....	29
Table 2A-2 Retroreflection of Sign Elements.....	29
Table 2A-3 Minimum Maintained Retroreflectivity Levels.....	31
Table 2A-4 Use of Sign Shapes	32
Table 2A-5 Common Uses of Sign Colors	33
Table 2B-1 Regulatory Sign and Plaque Sizes.....	46
Table 2B-2 Meanings of Symbols and Legends on Reversible Lane Control Signs	65
Table 2C-1 Categories of Warning Signs and Plaques.....	104
Table 2C-2 Warning Sign and Plaque Sizes.....	105
Table 2C-3 Minimum Size of Supplemental Warning Plaques	107
Table 2C-4 Guidelines for Advance Placement of Warning Signs	108
Table 2C-5 Horizontal Alignment Sign Selection	110
Table 2C-6 Approximate Spacing of Chevron Alignment Signs on Horizontal Curves.....	113
Table 2D-1 Conventional Road Guide Sign Sizes	139
Table 2D-2 Recommended Minimum Letter Heights on Street Name Signs	163
Table 2E-1 Freeway or Expressway Guide Sign and Plaque Sizes	186

Table 2E-2	Minimum Letter and Numeral Sizes for Expressway Guide Signs According to Interchange Classification	188
Table 2E-3	Minimum Letter and Numeral Sizes for Expressway Guide Signs According to Sign Type..	189
Table 2E-4	Minimum Letter and Numeral Sizes for Freeway Guide Signs According to Interchange Classification	190
Table 2E-5	Minimum Letter and Numeral Sizes for Freeway Guide Signs According to Sign Type ..	191
Table 2F-1	Toll Facility Sign and Plaque Minimum Sizes	237
Table 2G-1	Managed and Preferential Lanes Sign and Plaque Minimum Sizes.....	254
Table 2H-1	General Information Sign Sizes	292
Table 2I-1	General Service Sign and Plaque Sizes	299
Table 2J-1	Minimum Letter and Numeral Sizes for Specific Service Signs According to Sign Type.....	316
Table 2L-1	Example of Units of Information	328
Table 2M-1	Category Chart for Recreational and Cultural Interest Area Symbols.....	331
Table 2N-1	Emergency Management Sign Sizes	343
Table 3B-1	Minimum Passing Sight Distances for No-Passing Zone Markings	353
Table 3D-1	Standard Edge Line and Lane Line Markings for Preferential Lanes.....	418
Table 3F-1	Approximate Spacing for Delineators on Horizontal Curves	428
Table 4C-1	Warrant 1, Eight-Hour Vehicular Volume	440
Table 4C-2	Warrant 9, Adjustment Factor for Daily Frequency of Rail Traffic.....	450
Table 4C-3	Warrant 9, Adjustment Factor for Percentage of High-Occupancy Buses.....	450
Table 4C-4	Warrant 9, Adjustment Factor for Percentage of Tractor-Trailer Trucks	450
Table 4D-1	Recommended Minimum Number of Primary Signal Faces for Through Traffic on Approaches with Posted, Statutory, or 85 th -Percentile Speed of 45 mph or Higher	463
Table 4D-2	Minimum Sight Distance for Signal Visibility	463
Table 5A-1	Sign and Plaque Sizes on Low-Volume Roads	534
Table 6C-1	Recommended Advance Warning Sign Minimum Spacing.....	556
Table 6C-2	Stopping Sight Distance as a Function of Speed.....	557
Table 6C-3	Taper Length Criteria for Temporary Traffic Control Zones	559
Table 6C-4	Formulas for Determining Taper Length	559
Table 6E-1	Stopping Sight Distance as a Function of Speed.....	577
Table 6F-1	Temporary Traffic Control Zone Sign and Plaque Sizes	580
Table 6H-1	Index to Typical Applications	634
Table 6H-2	Meaning of Symbols on Typical Application Diagrams	635
Table 6H-3	Meaning of Letter Codes on Typical Application Diagrams	635
Table 6H-4	Formulas for Determining Taper Length	635
Table 7B-1	School Area Sign and Plaque Sizes.....	735
Table 8B-1	Grade Crossing Sign and Plaque Minimum Sizes	754
Table 9B-1	Bicycle Facility Sign and Plaque Minimum Sizes	793
Table A2-1	Conversion of Inches to Millimeters	A2-1
Table A2-2	Conversion of Feet to Meters	A2-1
Table A2-3	Conversion of Miles to Kilometers	A2-1
Table A2-4	Conversion of Miles per Hour to Kilometers/Hour	A2-1

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES INTRODUCTION

Standard:

- 01 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, 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.
- 02 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, 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 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.
- 03 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; 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.
- 04 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.

Support:

- 05 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.
- 06 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.

Standard:

- 07 The U.S. Secretary of Transportation, under authority granted by the Highway Safety Act of 1966, decreed that traffic control devices on all streets and highways open to public travel 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:

- 08 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:

- 09 *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."*

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	

Support:

¹⁰ 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, bikeways, and private roads open to public travel (see definition in Section 1A.13).

¹¹ 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.

Standard:

¹² 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.

Support:

¹³ 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:

¹⁴ 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.

¹⁵ 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:

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

¹⁷ 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.

¹⁸ 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.”

Standard:

¹⁹ 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).

²⁰ 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.

²¹ 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:

²⁴ 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.

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

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

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

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

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