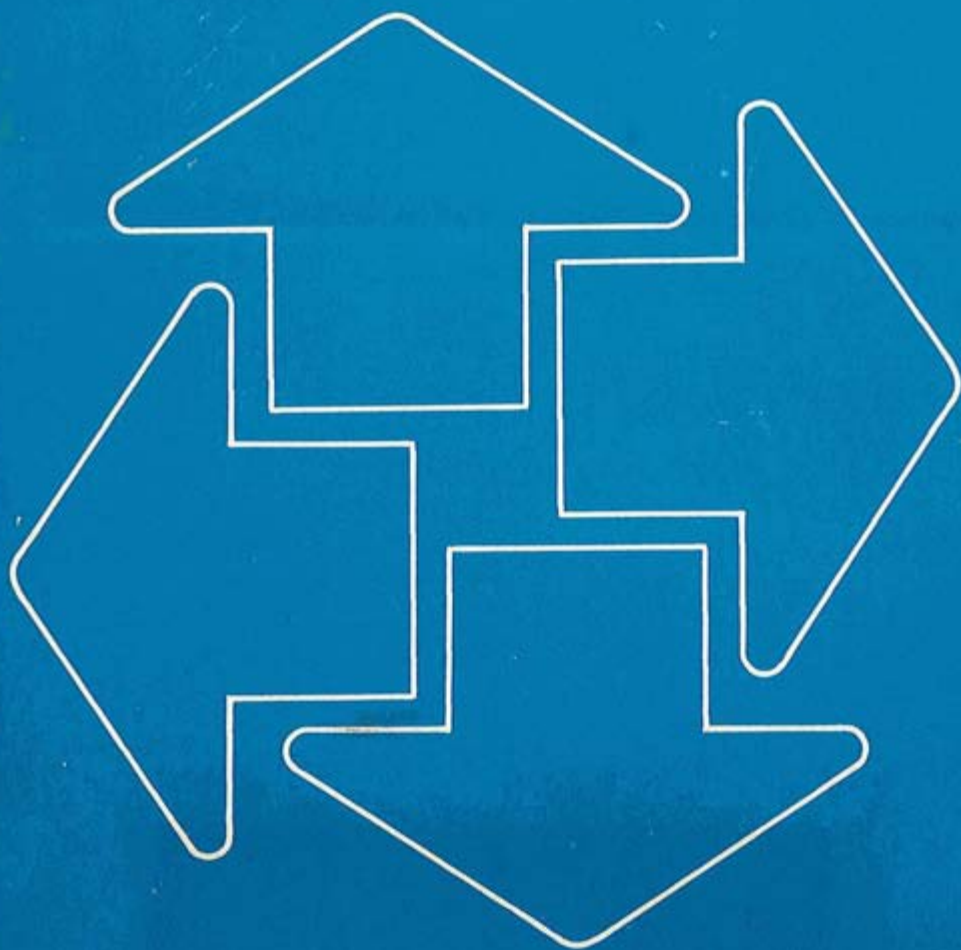




06.1—1971

MANUAL
ON
**UNIFORM
TRAFFIC
CONTROL
DEVICES**

FOR STREETS AND HIGHWAYS



TRAFFIC ENGR. SECTION

MANUAL
ON
**UNIFORM
TRAFFIC
CONTROL
DEVICES**

FOR STREETS AND HIGHWAYS

DEVELOPED WITH THE COOPERATION OF
THE AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS
AND THE NATIONAL JOINT COMMITTEE
ON UNIFORM TRAFFIC CONTROL DEVICES

American Association of State Highway Officials
Institute of Traffic Engineers
National Committee on Uniform Traffic Laws and Ordinances
National Association of Counties
National League of Cities

Adopted by the
Federal Highway Administrator
as a National Standard for Application
on all Classes of Highways



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
1971

Approved by the Federal Highway Administrator as the National Standard for all Highways open to public travel in accordance with Title 23, U.S. Code, Sections 109(b), 109(d) and 402(a).

November 13, 1970

Approved as an American National Standard by
the American National Standards Institute

D6.1-1971

(Supersedes D6.1-1961)

**NATIONAL JOINT COMMITTEE ON UNIFORM
TRAFFIC CONTROL DEVICES
COMMITTEE MEMBERSHIP**

From the American Association of State Highway Officials

- DAVID H. STEVENS, Chairman, Maine Highway Commission, Augusta, Maine
(AASHO chairman)
- EDMUND R. RICKER, Chief, Highway Safety Group, Pennsylvania Department
of Transportation, Harrisburg, Pennsylvania
- W. A. FRICK, Engineer of Traffic, Illinois Division of Highways, Springfield,
Illinois
- ELLIS L. MATHES, State Highway Engineer, Idaho Department of Highways,
Boise, Idaho
- CHARLES W. PRISK, Safety Coordinator, Office of Associate Administrator for
Planning, Federal Highway Administration, Washington, D.C.
- WAYNE N. VOLK, Chief Traffic Engineer, Wisconsin State Highway Commission,
Madison, Wisconsin
- JAMES E. WILSON, Acting Associate Director, Traffic Safety Programs, National
Highway Safety Bureau, Washington, D.C. (Chairman, NJC)

From the Institute of Traffic Engineers

- WILLIAM R. McGRATH, Vice President and Director of Transportation and
Traffic Planning, Raymond, Parish, and Pine, White Plains, New York
(ITE chairman)
- MICHAEL J. GITTENS, District Traffic Engineer, Pennsylvania Department of
Transportation, Pittsburgh, Pennsylvania
- ROSS T. SHOAF, Assistant City Engineer, San Francisco, California
- JAMES L. FOLEY, JR., Director, Office of Highway Safety, Federal Highway
Administration, Washington, D.C.
- MARBLE J. HENSLEY, President, Hensley-Schmidt, Inc., Chattanooga, Tennessee
- HOLDEN M. LeROY, Assistant Director, Department of Streets & Traffic, Detroit,
Michigan
- RICHARD A. WALONS, Associate City Traffic Engineer, Chicago, Illinois

From the National Committee on Uniform Traffic Laws and Ordinances

- HARRY PORTER, JR., Executive Secretary, National Safety Council, Chicago,
Illinois (NCUTLO chairman)
- HAROLD L. MICHAEL, Associate Director, Joint Highway Research Project,
Purdue University, Lafayette, Indiana
- P. H. FOLEY, Engineer, TOC&S Committee, Association of American Railroads,
Washington, D.C.
- WILLIAM H. FRANNEY, Director, Highway Safety Division, International Asso-
ciation of Chiefs of Police, Washington, D.C.
- BURTON W. MARSH, Former Executive Director, Institute of Traffic Engineers,
Washington, D.C.
- CARLTON C. ROBINSON, Director of Program Planning, Highway Users Federa-
tion for Safety and Mobility, Washington, D.C.
- HAROLD BURGESS, Superintendent, Department of State Police, Richmond,
Virginia

From the National Association of Counties

DELOS HAMLIN, Chairman, Oakland County Board of Supervisors, Farmington,
Michigan (NAC chairman)

RICHMOND H. KEENEY, Montgomery County Council, Rockville, Maryland

From the National League of Cities

WALTER HAHN, City Manager, San Diego, California

DELEGATES OR OFFICERS DURING THE
DEVELOPMENT OF THIS MANUAL

From the American Association of State Highway Officials

W. W. Bradley
F. B. Crandall
James E. P. Darrell
Frank Lyons
John Morton
Allan R. Pepper
M. L. Shadburn

From the Institute of Traffic Engineers

Louis E. Bender
Martin E. Bruening
Alger F. Malo
Cooper McEachern

From the National Committee on Uniform Traffic Laws & Ordinances

Donald S. Berry
H. A. Hudson
C. W. Stark
C. W. Woodson

From the National Association of Counties

Edward A. Rath

From the National League of Cities

Horace H. Edwards
Tom Fletcher
Frederick J. Richardson

Served as Staff Executive

J. Al Head, 1964 to 1967
Robert E. Conner, 1967 to 1971

Served as Secretary

William G. Eliot, 3rd, 1961 to 1965
Joseph E. Lema, 1965 to 1968
Sam E. Luebbert, 1968 to 1969
Richard A. Richter, 1969 to 1971

CONTENTS

	<i>Page</i>
Introduction.....	1
Part I—GENERAL PROVISIONS	
Section 1A- 1. Requirements of Traffic Control Devices.....	3
1A- 2. Responsibility for Traffic Control Devices.....	4
1A- 3. Engineering Study Required.....	5
1A- 4. Meanings of "Shall," "Should," and "May".....	5
1A- 5. Procedures for Developing New Standards and for Interpretation and Revision of Existing Standards..	6
1A- 6. Relation to Other Documents.....	7
1A- 7. Color Code.....	8
Part II—SIGNS	
A. Introduction and General Specifications	
Section 2A- 1. Function of Signs.....	11
2A- 2. Scope of Sign Standards.....	11
2A- 3. Legal Authority.....	12
2A- 4. Standardization of Application.....	12
2A- 5. Variable Message Signs.....	13
2A- 6. Excessive Use of Signs.....	13
2A- 7. Classification of Signs.....	13
2A- 8. Standardization of Signs.....	14
2A- 9. Design.....	14
2A-10. Shapes.....	14
2A-11. Sign Colors.....	15
2A-12. Dimensions.....	16
2A-13. Symbols.....	16
2A-14. Word Messages.....	16
2A-15. Lettering.....	17
2A-16. Illumination and Reflectorization.....	17
2A-17. Means of Illumination.....	17
2A-18. Means of Reflectorization.....	19
2A-19. Sign Borders.....	19
2A-20. Supplemental Beacons.....	19
2A-21. Standardization of Location.....	19
2A-22. Overhead Sign Installations.....	21
2A-23. Height.....	21
2A-24. Lateral Clearance.....	24
2A-25. Position of Signs.....	27
2A-26. Erection.....	27
2A-27. Posts and Mountings.....	27
2A-28. Bridges for Sign Supports.....	30
2A-29. Sign Materials.....	30
2A-30. Maintenance.....	30
B. Regulatory Signs	
Section 2B- 1. Application of Regulatory Signs.....	30
2B- 2. Classification of Regulatory Signs.....	31
2B- 3. Design of Regulatory Signs.....	31
2B- 4. Stop Sign (R1-1).....	32
2B- 5. Warrants for Stop Sign.....	32

	<i>Page</i>
2B- 6. Multiway Stop Sign.....	33
2B- 7. Yield Sign (R1-2).....	34
2B- 8. Warrants for Yield Sign.....	34
2B- 9. Location of Stop Sign and Yield Sign.....	35
2B-10. Speed Limit Sign (R2-1).....	35
2B-11. Night Speed Sign (R2-3).....	36
2B-12. Minimum Speed Sign (R2-4).....	37
2B-13. Location of Speed Limit Sign.....	38
2B-14. Sign for Reduced Speed Ahead (R2-5).....	38
2B-15. Turn Prohibition Sign (R3-1 to 3).....	39
2B-16. U-Turn Prohibition Sign (R3-4).....	40
2B-17. Lane-Use Control Signs (R3-5 to 9).....	40
2B-18. Application of Lane-Use Control Signs at Intersections.....	42
2B-19. Location of Lane-Use Control Signs.....	42
2B-20. Do Not Pass Sign (R4-1).....	42
2B-21. Pass With Care Sign (R4-2).....	43
2B-22. Slower Traffic Keep Right Sign (R4-3).....	44
2B-23. Signs for Uphill Traffic Lanes (R4-5, 6).....	44
2B-24. Keep Right Sign (R4-7).....	45
2B-25. Do Not Enter Sign (R5-1).....	46
2B-26. Wrong Way Sign (R5-9).....	47
2B 27. Selective Exclusion Signs.....	47
2B-28. One Way Signs (R6-1, 2).....	50
2B-29. Urban Parking and Stopping Signs (R7 series).....	51
2B-30. Placement of Urban Parking Signs.....	53
2B-31. Parking Prohibition Signs in Rural Districts (R8-1, 2, 3, 5, 6).....	53
2B-32. Emergency Parking Signs (R8-4, 7).....	54
2B-33. Walk on Left and No Hitchhiking Signs (R9-1, 4).....	55
2B-34. Pedestrian Crossing Signs (R9-2, 3).....	56
2B-35. Traffic Signal Signs (R10-1 to 4).....	56
2B-36. Keep off Median Sign (R11-1).....	58
2B-37. Road Closed Sign (R11-2).....	59
2B-38. Local Traffic Only Sign (R11-3, 4).....	59
2B-39. Weight Limit Signs (R12-1 to 4).....	60
2B-40. Weigh Station Signs (R13 series).....	61
2B-41. Truck Route Sign (R14-1).....	62
2B-42. Railroad Crossbuck Sign (R15-1, 2).....	62
2B-43. Other Regulatory Signs.....	63
 C. Warning Signs	
Section 2C- 1. Application of Warning Signs.....	63
2C- 2. Design of Warning Signs.....	64
2C- 3. Placement of Warning Signs.....	65
2C- 4. Turn Sign (W1-1).....	65
2C- 5. Curve Sign (W1-2).....	66
2C- 6. Reverse Turn Sign (W1-3).....	66
2C- 7. Reverse Curve Sign (W1-4).....	67
2C- 8. Winding Road Sign (W1-5).....	67
2C- 9. Large Arrow Sign (W1-6, 7).....	67
2C-10. Cross Road Sign (W2-1).....	68
2C-11. Side Road Sign (W2-2, 3).....	69
2C-12. T Symbol Sign (W2-4).....	69
2C-13. Y Symbol Sign (W2-5).....	70

	<i>Page</i>
2C-14. Stop Ahead Sign (W3-1).....	70
2C-15. Yield Ahead Sign (W3-2).....	70
2C-16. Signal Ahead Sign (W3-3).....	71
2C-17. Merge Sign (W4-1).....	71
2C-18. Pavement Width Transition Signs (W4-2, W9-1, 2)....	72
2C-19. Road Narrows Sign (W5-1).....	73
2C-20. Narrow Bridge Sign (W5-2).....	73
2C-21. One Lane Bridge Sign (W5-3).....	73
2C-22. Divided Highway (Road) Sign (W6-1).....	73
2C-23. Divided Highway (Road) Ends Sign (W6-2).....	74
2C-24. Two-Way Traffic Sign (W6-3).....	74
2C-25. Hill Sign (W7-1, 2).....	75
2C-26. Bump Sign (W8-1).....	76
2C-27. Dip Sign (W8-2).....	76
2C-28. Pavement Ends Sign (W8-3).....	77
2C-29. Soft Shoulder Sign (W8-4).....	77
2C-30. Slippery When Wet Sign (W8-5).....	77
2C-31. Railroad Advance Warning Sign (W10-1).....	78
2C-32. Bicycle Crossing Sign (W11-1).....	78
2C-33. Other Crossing Signs (W11 series).....	78
2C-34. Double Arrow Sign (W12-1).....	79
2C-35. Low Clearance Sign (W12-2).....	80
2C-36. Advisory Speed Plate (W13-1).....	81
2C-37. Advisory Exit Speed Signs (W13-2, 3).....	82
2C-38. Dead End Signs (W14-1, 2).....	82
2C-39. No Passing Zone Sign (W14-3).....	83
2C-40. Other Warning Signs.....	83

D. Guide Signs—Conventional Roads

Section	2D- 1. Scope of Conventional Road Guide Sign Standards....	83
	2D- 2. Application.....	83
	2D- 3. Color, Reflectorization and Illumination.....	84
	2D- 4. Size of Signs.....	84
	2D- 5. Lettering Style.....	84
	2D- 6. Size of Lettering.....	85
	2D- 7. Amount of Legend.....	85
	2D- 8. Arrows and Symbols.....	86
	2D- 9. Numbered Highway Systems.....	86
	2D-10. Route Markers and Auxiliary Markers.....	88
	2D-11. Design of Route Markers (M1-1 to 7).....	88
	2D-12. Design of Route Marker Auxiliaries.....	91
	2D-13. Junction Marker (M2-1).....	91
	2D-14. Combination Junction Sign (M2-2).....	92
	2D-15. Cardinal Direction Marker (M3-1 to 4).....	92
	2D-16. Markers for Alternative Routes.....	93
	2D-17. Alternate Marker (M4-1).....	93
	2D-18. By-pass Marker (M4-2).....	94
	2D-19. Business Route Marker (M4-3).....	94
	2D-20. Truck Route Marker (M4-4).....	94
	2D-21. To Marker (M4-5).....	94
	2D-22. End Marker (M4-6).....	94
	2D-23. Temporary Marker (M4-7).....	95
	2D-24. Detour Marker (M4-8).....	95
	2D-25. Detour Sign (M4-9).....	95

	<i>Page</i>
2D-26. Advance Turn Arrow (M5-1, 2).....	96
2D-27. Directional Arrow (M6-1 to 7).....	96
2D-28. Route Marker Assemblies.....	97
2D-29. Junction Assembly.....	98
2D-30. Advance Route Turn Assembly.....	98
2D-31. Directional Assembly.....	98
2D-32. Confirming Assembly.....	99
2D-33. Confirming Assembly used as a Reassurance Marker... ..	100
2D-34. Trailblazers.....	100
2D-35. Destination and Mileage Signs.....	101
2D-36. Destination Signs (D1-1 to 3).....	101
2D-37. Location of Destination Signs.....	103
2D-38. Mileage Sign (D2-1 to 3).....	103
2D-39. Location of Mileage Signs.....	104
2D-40. Street Name Sign (D3).....	104
2D-41. Parking Area Sign (D4).....	105
2D-42. Rest Area Signs (D5-1 to 5).....	106
2D-43. Scenic Area Signs (D6-1 to 3).....	106
2D-44. Recreation Area Signs (D7-1, 2).....	107
2D-45. Weigh Station Signing (D8-1 to 3).....	107
2D-46. Service Signs (D9-1 to 3).....	109
2D-47. Mileposts (D10-1 to 3).....	110
2D-48. Bicycle Route (D11-1).....	111
2D-49. Traffic Signal Speed Signs (I1-1).....	112
2D-50. General Information Signs (I Series).....	112
2D-51. Signing of Named Highways.....	113
E. Guide Signs—Expressway	
Section 2E- 1. Scope of Expressway Guide Sign Standards.....	113
2E- 2. Application.....	113
2E- 3. General Standards.....	114
2E- 4. Functions of Expressway Guide Signs.....	114
2E- 5. Color of Expressway Guide Signs.....	114
2E- 6. Reflectorization or Illumination.....	115
2E- 7. Size of Expressway Guide Signs.....	215
2E- 8. Amount of Legend on Expressway Guide Signs.....	115
2E- 9. Style of Lettering.....	116
2E-10. Size of Lettering.....	116
2E-11. Interline and Edge Spacing.....	119
2E-12. Abbreviations.....	119
2E-13. Symbols.....	119
2E-14. Arrows.....	119
2E-15. Viewing Factors.....	120
2E-16. Overhead Sign Installations.....	120
2E-17. Urban Expressways.....	120
2E-18. Expressway Guide Sign Classification.....	121
2E-19. Route Markers and Trailblazers.....	121
2E-20. Signs for Intersections at Grade (fig. 2-10).....	122
2E-21. Expressway Interchange Classification.....	122
2E-22. Interchange and Exit Numbering.....	123
2E-23. Interchange Guide Signs.....	123
2E-24. Advance Guide Signs (fig 2-11).....	123
2E-25. Next Exit Supplemental Sign (fig 2-12).....	125
2E-26. Other Supplemental Signs (fig 2-13).....	126

	<i>Page</i>
2E-27. Exit Direction Signs (fig. 2-14).....	127
2E-28. Gore Signs (figs. 2-15, 16).....	128
2E-29. Post-Interchange Signs.....	130
2E-30. Mileage Signs (fig. 2-17).....	130
2E-31. Interchange Sequence Signs (fig. 2-18).....	131
2E-32. Next (3) Exits Area Signs (fig. 2-19).....	132
2E-33. Signing for Services (fig. 2-20).....	132
2E-34. Uniform Signing by Type of Interchange.....	133
2E-35. Rest and Scenic Areas.....	133
2E-36. Recreation Area Signs.....	134
2E-37. Milepost Markers.....	135
2E-38. Miscellaneous Guide Signs (fig. 2-21).....	135
2E-39. Special Signing on Expressway Approaches and Connecting Roadways.....	135
F. Guide Signs—Freeways	
Section 2F- 1. Scope of Freeway Sign Standards.....	136
2F- 2. Freeway Signing Principles.....	136
2F- 3. General Characteristics of Freeway Signing.....	137
2F- 4. Characteristics of Urban Freeway Signing.....	137
2F- 5. Characteristics of Rural Freeway Signing.....	138
2F- 6. Sign Layouts.....	138
2F- 7. Diagrammatic Signs (figs. 2-22, 23).....	138
2F- 8. Designation of Destination.....	140
2F- 9. Limit on Destination Legends.....	140
2F-10. Routing to a Given Destination.....	141
2F-11. Overhead Sign Installation.....	141
2F-12. Style of Lettering and Legend Spacing.....	141
2F-13. Sign Borders.....	144
2F-14. Color, Reflectorization and Illumination.....	144
2F-15. Sign Arrows.....	145
2F-16. Viewing Factors.....	145
2F-17. Vertical Clearance.....	145
2F-18. Horizontal Clearance.....	145
2F-19. Interchange Classification.....	146
2F-20. Interchange Exit Numbering (figs. 2-24 through 2-26).....	146
2F-21. Interchange Guide Signs.....	150
2F-22. Post Interchange Signs.....	150
2F-23. Signing by Class of Interchange.....	150
2F-24. Interchanges Between Freeways (fig. 2-27).....	150
2F-25. Cloverleaf (figs. 2-28, 29).....	152
2F-26. Cloverleaf with Collector-Distributor Roadways (fig. 2-30).....	153
2F-27. Partial Cloverleaf (fig. 2-31).....	156
2F-28. Diamond (fig. 2-32).....	157
2F-29. Urban Diamond (fig. 2-33).....	157
2F-30. Closely Spaced Interchanges (fig. 2-34).....	158
2F-31. Minor Interchange (fig. 2-35).....	159
2F-32. Signing for Services (fig. 2-36).....	160
2F-33. Specific Services Information.....	163
2F-34. Rest and Scenic Area Signs (fig. 2-37).....	163
2F-35. Weigh Station Signing (fig. 2-38).....	164
2F-36. Milepost Markers.....	164

	<i>Page</i>
2F-37. Route Markers and Trailblazers (figs. 2-39 through 2-41).....	166
2F-38. Miscellaneous Freeway Guide Signs.....	167
2F-39. Signing on Freeway Approaches.....	170

G. Signing for Civil Defense

Section 2G- 1. Civil Defense Emergencies.....	170
2G- 2. Design of Civil Defense Signs.....	171
2G- 3. Evacuation Route Marker (CD-1).....	171
2G- 4. Area Closed Sign (CD-2).....	172
2G- 5. Traffic Regulation Post Sign (CD-3).....	173
2G- 6. Emergency Speed Sign (CD-4).....	173
2G- 7. Road Use Permit Sign (CD-5).....	174
2G- 8. Emergency Aid Centers Sign (CD-6).....	174
2G- 9. Fallout Shelter Direction Sign (CD-7).....	175

Part III—MARKINGS

A. General Principles

Section 3A- 1. Functions and Limitations.....	177
3A- 2. Standardization of Application.....	177
3A- 3. Materials.....	178
3A- 4. Colors.....	178
3A- 5. General Principles—Longitudinal and Pavement Markings.....	178
3A- 6. Widths and Patterns of Longitudinal Lines.....	179
3A- 7. Types of Longitudinal Lines.....	179
3A- 8. Transverse Markings.....	180
3A- 9. Curb Markings.....	180

B. Applications of Pavement and Curb Markings

Section 3B- 1. Center Lines.....	181
3B- 2. Lane Lines.....	181
3B- 3. No-Passing Zone Markings.....	186
3B- 4. Application of No-Passing Zone Markings.....	186
3B- 5. Warrants for No-Passing Zones at Curves.....	190
3B- 6. Pavement Edge Lines.....	190
3B- 7. Pavement Marking Extensions Through Intersections or Interchanges.....	191
3B- 8. Lane Reduction Transitions.....	191
3B- 9. Channelizing Line.....	194
3B-10. Median Islands Formed by Pavement Markings.....	194
3B-11. Marking of Interchange Ramps.....	194
3B-12. Combination Lane and Center Line Markings for Unique Applications.....	194
3B-13. Approach to an Obstruction.....	198
3B-14. Stop Lines.....	198
3B-15. Crosswalks and Crosswalk Lines.....	199
3B-16. Approach to Railroad Crossing.....	202
3B-17. Parking Space Markings.....	202
3B-18. Pavement Word and Symbol Markings.....	205
3B-19. Curb Markings for Parking Restrictions.....	207

	<i>Page</i>
C. Object Markings	
Section 3C- 1. Object Marker Design.....	209
3C- 2. Objects in the Roadway.....	209
3C- 3. Objects Adjacent to the Roadway.....	211
3C- 4. End of Roadway.....	211
D. Delineation	
Section 3D- 1. Delineators.....	211
3D- 2. Design.....	211
3D- 3. Curb Markings for Delineation.....	212
3D- 4. Delineator Application.....	212
3D- 5. Delineator Placement and Spacing.....	213
E. Colored Pavements	
Section 3E- 1. Colored Pavements.....	213
3E- 2. Colors.....	213

Part IV—SIGNALS

A. General	
Section 4A- 1. Types.....	215
4A- 2. Basis of Installation.....	215
B. Traffic Control Signals	
Section 4B- 1. General Aspects.....	215
4B- 2. Area of Control.....	215
4B- 3. Advantages and Disadvantages of Traffic Control Signals.....	216
4B- 4. Portable Traffic Control Signals.....	216
4B- 5. Meaning of Signal Indications.....	216
4B- 6. Application of Signal Indications.....	218
4B- 7. Number of Lenses per Signal Face.....	220
4B- 8. Size and Design of Signal Lenses.....	220
4B- 9. Arrangement of Lenses in Signal Faces.....	221
4B-10. Illumination of Lenses.....	223
4B-11. Visibility and Shielding of Signal Faces.....	224
4B-12. Number and Locations of Signal Faces.....	224
4B-13. Height of Signal Faces.....	227
4B-14. Transverse Location of Traffic Signal Supports and Controller Cabinets.....	227
4B-15. Vehicle Change Interval.....	228
4B-16. Unexpected Conflicts During Green Interval.....	228
4B-17. Coordination of Traffic Control Signals.....	229
4B-18. Flashing Operation of Traffic Control Signals.....	229
4B-19. Continuity of Operation.....	230
4B-20. Signal Operation Must Relate to Traffic Flow.....	230
4B-21. Traffic Signals Near Grade Crossings.....	230
4B-22. Emergency Operation of Traffic Signals.....	231
4B-23. Maintenance of Traffic Control Signals.....	232
4B-24. Painting.....	233
4B-25. Vehicle Detectors.....	233
4B-26. Auxiliary Signs.....	233
4B-27. Removal of Confusing Advertising Lights.....	234

C. Warrants

Section 4C- 1. Advance Engineering Data Required.....	234
4C- 2. Warrants for Traffic Signal Installation.....	235
4C- 3. Warrant 1, Minimum Vehicular Volume.....	236
4C- 4. Warrant 2, Interruption of Continuous Traffic.....	236
4C- 5. Warrant 3, Minimum Pedestrian Volume.....	237
4C- 6. Warrant 4, School Crossing.....	238
4C- 7. Warrant 5, Progressive Movement.....	239
4C- 8. Warrant 6, Accident Experience.....	239
4C- 9. Warrant 7, Systems Warrant.....	239
4C-10. Warrant 8, Combination of Warrants.....	240
4C-11. Factors Governing Selection of Type of Control.....	240
4C-12. Pedestrian-Actuated Control.....	240

D. Pedestrian Signals

Section 4D- 1. Pedestrian Signal Indications.....	241
4D- 2. Meanings of Pedestrian Indications.....	241
4D- 3. Applications of Pedestrian Signal Indications.....	241
4D- 4. Design Requirements.....	242
4D- 5. Location.....	243
4D- 6. Detectors.....	244
4D- 7. Pedestrian Intervals and Phases.....	244

E. Other Highway Traffic Signals

Section 4E- 1. Hazard Identification Beacon.....	246
4E- 2. Speed Limit Sign Beacon.....	246
4E- 3. Intersection Control Beacon.....	246
4E- 4. Stop Sign Beacon.....	248
4E- 5. General Design and Operation of Beacons.....	248
4E- 6. Hazard Identification Beacon Location.....	249
4E- 7. Intersection Control Beacon Location.....	249
4E- 8. Lane-Use Control Signals.....	249
4E- 9. Meaning of Lane-use Control Signal Indications.....	250
4E-10. Design of Lane-use Control Signals.....	250
4E-11. Location of Lane-use Control Signals.....	251
4E-12. Operation of Lane-use Control Signals.....	251
4E-13. Traffic Signals at Drawbridges.....	252
4E-14. Application of Drawbridge Signals.....	252
4E-15. Design of Drawbridge Signals.....	252
4E-16. Location of Drawbridge Signals.....	253
4E-17. Operation of Drawbridge Signals.....	253
4E-18. Traffic Signals for Emergency Vehicle Movements.....	254
4E-19. Applications of Emergency-Traffic Signals.....	254
4E-20. Design of Emergency-Traffic Signals.....	255
4E-21. Operation of Emergency-Traffic Signals.....	255

F. Train-Approach Signals and Gates

Section 4F- 1. Railroad-Highway Grade-Crossing Protection.....	256
4F- 2. Application of Railroad Grade-Crossing Signals, Gates and Variable Signs.....	256
4F- 3. Proper Motorist Response to Railroad-Highway Grade- Crossing Signals.....	257
4F- 4. Types of Control, Design, Location, Installation, Operation and Maintenance.....	257

Part V—ISLANDS

	<i>Page</i>
A. General	
Section 5A- 1. Scope of Island Standards.....	259
5A- 2. Legal Authority.....	259
5A- 3. Classification and Function.....	259
5A- 4. Pedestrian Refuge Islands.....	259
5A- 5. Traffic Divisional Islands.....	260
5A- 6. Traffic Channelizing Islands.....	260
B. Design	
Section 5B- 1. General.....	261
5B- 2. Size and Shape.....	261
5B- 3. Designation of Island Areas.....	262
C. Approach End Treatment	
Section 5C- 1. General.....	263
5C- 2. Method.....	263
D. Illumination	
	264
E. Signs	
Section 5E- 1. General.....	264
5E- 2. Application.....	264
F. Markings	
Section 5F- 1. General.....	265
5F- 2. Application.....	265
5F- 3. Colors.....	265
5F- 4. Object Markers.....	266
5F- 5. Delineators.....	266

Part VI—TRAFFIC CONTROLS FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS

A. Introduction and General Specifications	
Section 6A- 1. Need for Standards.....	267
6A- 2. Scope.....	267
6A- 3. Application of Standards.....	267
6A- 4. Responsibility.....	268
6A- 5. General Requirements.....	269
B. Signs	
Section 6B- 1. Design of Signs.....	269
6B- 2. Illumination and Reflectorization.....	270
6B- 3. Position of Signs.....	270
6B- 4. Erection of Signs.....	281
<i>Regulatory Signs</i>	
6B- 5. Authority.....	282
6B- 6. Design.....	282
6B- 7. Application.....	282
6B- 8. Road (Street) Closed Sign (R11-2).....	283
6B- 9. Local Traffic Only Signs (R11-3, 4).....	284
6B-10. Weight Limit Signs (R12-1, 2).....	284
6B-11. Special Regulatory Signs.....	285

Warning Signs

6B-12	Function.....	285
6B-13	Design and Application.....	285
6B-14	Application of Construction Approach Warning Signs....	286
6B-15	Advance Road (Street) Construction Sign (W20-1).....	286
6B-16	Advance Detour Sign (W20-2).....	287
6B-17	Advance Road (Street) Closed Sign (W20-3).....	287
6B-18	Advance One Lane Road Sign (W20-4).....	288
6B-19	Advance Lane Closed Sign (W20-5).....	288
6B-20	Advance Flagman Sign (W20-7).....	288
6B-21	Two-Way Traffic Sign (W6-3).....	289
6B-22	Application of Maintenance and Minor Construction Warning Signs.....	289
6B-23	Men Working Sign (W21-1).....	292
6B-24	Fresh Oil Sign (W21-2).....	292
6B-25	Road Machinery Sign (W21-3).....	292
6B-26	Road Work Sign (W21-4).....	292
6B-27	Shoulder Work Sign (W21-5).....	293
6B-28	Survey Crew Sign (W21-6).....	293
6B-29	Signs for Blasting Areas.....	293
6B-30	Blasting Zone Sign (W22-1).....	294
6B-31	Turn Off 2-Way Radios Sign (W22-2).....	294
6B-32	End Blasting Zone Sign (W22-3).....	294
6B-33	Other Warning Signs.....	295
6B-34	Advisory Speed Plate (W13-1).....	295

Guide Signs

6B-35	Function and Design of Information and Guide Signs..	296
6B-36	Length of Construction Sign (G20-1).....	296
6B-37	End Construction (Road Work) Sign (G20-2).....	296
6B-38	Detour and Detour Arrow Signs (M4-9, 10).....	297
6B-39	Pilot Car Sign (G20-4).....	297

C. Barricades and Channelizing Devices

Section	6C- 1. Function.....	298
	6C- 2. Barricade Design.....	298
	6C- 3. Cone Design.....	300
	6C- 4. Drum Design.....	300
	6C- 5. Vertical Panel Design.....	301
	6C- 6. Barricade Construction.....	302
	6C- 7. Barricade Application.....	302
	6C- 8. Barrel or Drum Application.....	305
	6C- 9. Traffic Cone Application.....	305
	6C-10. Delineator Application.....	306
	6C-11. Pavement Markings Application.....	306
	6C-12. Channelization.....	307

D. Lighting Devices

Section	6D- 1. Function.....	308
	6D- 2. Floodlights.....	308
	6D- 3. Hazard Identification Beacons (Flashing Electric Lights)	309
	6D- 4. Steady Burning Electric Lamps.....	310
	6D- 5. Barricade Warning Lights.....	310
	6D- 6. Special Lighting Units.....	311
	6D- 7. Lanterns or Torches.....	312

E. Control of Traffic Through Work Areas

Section 6E- 1. Function.....	312
6E- 2. Hand Signaling Devices.....	312
6E- 3. Flagmen.....	313
6E- 4. Flagging Procedures.....	314
6E- 5. Flagman Stations.....	315
6E- 6. One-Way Traffic Control.....	316
6E- 7. Flagman Control.....	316
6E- 8. Flag-Carrying or Official Car.....	316
6E- 9. Pilot Car.....	317
6E-10. Traffic Control Signals.....	317

F. Expressways and Limited Access Facilities

Section 6F- 1. Application of Standards.....	317
6F- 2. Problem Areas.....	318
6F- 3. Signs.....	318
6F- 4. Barricades and Channelization.....	319
6F- 5. Lighting Devices.....	320
6F- 6. Control of Traffic.....	320

Part VII—TRAFFIC CONTROLS FOR SCHOOL AREAS**A. General**

Section 7A- 1. Need for Standards.....	321
7A- 2. School Routes and Established School Crossings.....	323
7A- 3. School Crossing Control Criteria.....	323
7A- 4. Scope.....	324
7A- 5. Application of Standards.....	324
7A- 6. Engineering Study Required.....	324
7A- 7. Maintenance of Traffic Control Devices.....	324
7A- 8. Legal Authority.....	325
7A- 9. Removal of Confusing Advertising.....	325
7A-10. Meanings of "Shall," "Should" and "May".....	325

B. Signs

Section 7B- 1. Design of Signs.....	325
7B- 2. Dimensions.....	326
7B- 3. Lettering.....	326
7B- 4. Sign Borders.....	326
7B- 5. Illumination and Reflectorization.....	326
7B- 6. Position of Signs.....	326
7B- 7. Height of Signs.....	327
7B- 8. Erection of Signs.....	327
7B- 9. School Advance Sign (S1-1).....	327
7B-10. School Crossing Sign (S2-1).....	327
7B-11. School Bus Stop Ahead Sign.....	328
7B-12. School Speed Limit Signs (S4-1 through 4).....	328
7B-13. Parking and Stopping Signs (R7 series).....	330

C. Markings

Section 7C- 1. Functions and Limitations of Markings.....	331
7C- 2. Standardization.....	331

	<i>Page</i>
7C- 3. Crosswalk Lines.....	331
7C- 4. Stop Lines.....	332
7C- 5. Curb Markings for Parking Restrictions.....	332
7C- 6. Word and Symbol Markings.....	332
D. School Area Traffic Signals	
Section 7D- 1. Definition.....	334
7D- 2. Advantages and Disadvantages.....	334
7D- 3. Standardization.....	335
7D- 4. Warrants.....	335
7D- 5. Meaning of Signal Indications.....	336
7D- 6. Intersection and Non-intersection Installations.....	338
7D- 7. Controllers.....	338
7D- 8. Pedestrian Detectors.....	338
7D- 9. Operation of Pedestrian Signals.....	339
7D-10. Coordination with Adjacent Signals.....	340
7D-11. Vehicle Change Interval.....	340
7D-12. Location and Placement.....	341
7D-13. Visibility, Number and Location of Signal Faces.....	341
7D-14. Height of Signal Faces.....	342
7D-15. Transverse Location of Traffic Signal Supports and Controller Cabinets.....	343
7D-16. Portable Traffic Control Signals.....	343
7D-17. Area of Control.....	343
7D-18. Design Requirements for School Signal Indications.....	343
7D-19. Number of Lenses per Signal Face.....	343
7D-20. Size and Design of Signal Lenses.....	344
7D-21. Arrangement of Lenses in Signal Faces.....	344
7D-22. Illumination of Lenses in Vehicular Signal Faces.....	344
7D-23. Pedestrian Indications.....	344
7D-24. Speed Limit Sign Beacon.....	345
7D-25. School Crossings at Existing Signal Installations.....	345
7D-26. Signal Indications.....	346
7D-27. Signal Control.....	346
7D-28. Signal Operation.....	346
E. Crossing Supervision	
Section 7E- 1. Types of Crossing Supervision.....	346
7E- 2. Adult Guards.....	347
7E- 3. Legal Authority for Adult Guards.....	347
7E- 4. Choice of Adult Guards.....	347
7E- 5. Uniform of Adult Guards.....	347
7E- 6. Operating Procedures for Adult Guards.....	347
7E- 7. Police Officers.....	347
7E- 8. Student Patrols.....	348
7E- 9. Legal Authority for Student Patrols.....	348
7E-10. Choice of Student Patrols.....	348
7E-11. Operating Procedures for Student Patrols.....	348
F. Grade Separated Crossings	
Section 7F- 1. Function.....	348
7F- 2. Types of Grade Separated Crossings.....	348
7F- 3. Criteria for Use of Grade Separated Crossings.....	349

Part VIII—DEFINITIONS

	<i>Page</i>
Section 8A- 1. Definition of Words and Phrases.....	351
8A- 2. General Definitions.....	351
8A- 3. Definitions Relating to Signs.....	354
8A- 4. Definitions Relating to Markings.....	354
8A- 5. Definitions Relating to Signals.....	355
8A- 6. Definitions Relating to Islands.....	356
8A- 7. Definitions Relating to Construction and Maintenance Traffic Controls.....	357
INDEX.....	359

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

INTRODUCTION

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

The need for high uniform standards was recognized long ago. The American Association of State Highway Officials (AASHO) published a manual for rural highways in 1927 and the National Conference on Street and Highway Safety published a manual for urban streets in 1929. But the necessity for unification of the standards applicable to different road and street systems was obvious. To meet this need, a joint committee of the American Association of State Highway Officials and the National Conference on Street and Highway Safety developed, and published in 1935, the original edition of this Manual on Uniform Traffic Control Devices. That committee, though changed from time to time in organization and personnel, has been in continuous existence and has been responsible for periodic revisions of the Manual, including this 1970 edition.

The current parent organizations of the National Joint Committee on Uniform Traffic Control Devices are: American Association of State Highway Officials, 341 National Press Building, Washington, D.C. 20004; Institute of Traffic Engineers, 2029 K Street, N.W., Washington, D.C. 20006; National Committee on Uniform Traffic Laws and Ordinances, 525 School Street, S.W., Washington, D.C. 20024; National Association of Counties, 1001 Connecticut Avenue, N.W., Washington, D.C. 20036; and the National League of Cities, 1612 K Street, N.W., Washington, D.C. 20006.

In the preparation of this Manual, the National Joint Committee on Uniform Traffic Control Devices has utilized its Executive Committee and the Technical Subcommittees for Research, Interpretations, Signs, Markings, Signals, Islands, Colors, Traffic Controls for School Areas, Traffic Controls for Street and Highway Construction and Maintenance Operations, and for Publications and Editing.

The National Joint Committee on Uniform Traffic Control Devices draws on the talents of persons in addition to its formal membership in the conduct of its work. All of the members on the National Joint Committee and members of its committees serve on a voluntary

basis, giving freely of their time in the Manual deliberations, both in technical committee work in their home areas and at the two meetings held each year.

Staff for the National Joint Committee on Uniform Traffic Control Devices, a Secretary and Staff Executive, is provided by the Federal Highway Administration, Department of Transportation. Correspondence should be addressed to the Secretary, National Joint Committee on Uniform Traffic Control Devices, Federal Highway Administration, Washington, D.C. 20591.

1970 REVISION

In recognition of the proven international value and need for symbols, and to present a uniform and better understood system of signing, this 1970 revision includes a wider use of symbols, both in the regulatory and warning series. Color coding is employed more extensively in signs, and to define direction of travel by pavement markings. This Manual also includes, for the first time, a complete and separate part covering traffic controls for school areas (Part VII). Standards for traffic signals (Part IV) also have been updated. Civil Defense Signing, Part VI, in the previous edition, is now included in Part II, Signs. Definitions applicable to this Manual are presented in Part VIII.

Highway authorities should provide a reasonable time period for changing existing installations to conform to this Manual. While installations should, for economy, be updated at the end of normal service life, public safety may sometimes dictate an earlier replacement. For example, the revised system of pavement markings should desirably be made during a relatively short period of time in each State and this coordinated on a regional basis. It is also recognized that motorists must be adequately informed about the new marking system before it is implemented.

It is expected that the implementation of this Manual on the Federal-aid highway systems, will be governed by federal directives. Because of the importance of uniform control device application on all roads and streets, local jurisdictions are encouraged to follow, as closely as possible, future implementation schedules issued for State or Federal highway systems.