



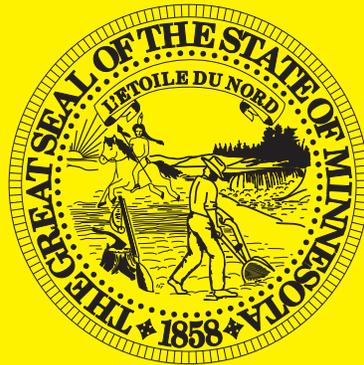
**Minnesota Manual
on
Uniform Traffic
Control Devices**

MN

MUTCD

December 2019

**MINNESOTA
MANUAL
ON
UNIFORM
TRAFFIC
CONTROL
DEVICES**



**MN
MUTCD
December 2019**



Office of Traffic Engineering
1500 West County Road B2 – MS 725
Roseville, MN 55113

December, 16, 2019

To: Holders of the 2011 Minnesota Manual on Uniform Traffic Control Devices

Transmitted herewith is Revision Number 7 (September 30, 2019) to the "2011 Minnesota Manual on Uniform Traffic Control Devices" (2011 MN MUTCD) as adopted by the Commissioner of the Minnesota Department of Transportation (MnDOT). The attached pages to the 2011 MN MUTCD incorporate changes or corrections brought about by changes in the FHWA MUTCD and Minnesota practices or procedures.

All revised pages are attached herewith and shall replace corresponding pages in this manual. The attached Commissioner's Order No. 98253 amends Commissioner's Orders 93167, 93799, 94040, 94687, 97233, and 97267. It is important to retain all Orders because they amend but do not replace previous Orders.

The 2011 MN MUTCD including Revision Numbers 1, 2, 3, 4, 5, 6, and 7 is available on the MnDOT website at <http://www.dot.state.mn.us/trafficeng/publ/mutcd/index.html>. This manual will be updated annually, typically near the beginning of each calendar year. The latest version will be available on the website after it has been adopted by the Commissioner of Transportation.

MnDOT no longer maintains a mailing list for printed updates to this manual. Users of the manual must fill out the "Subscribe to Traffic Engineering resource updates" form found on the website above under "Related links." When an update/revision is made to the manual, an email will be sent out advising users to visit the website. The user must then download and print the revised pages and insert them into the printed version of their 2011 MN MUTCD.

To purchase additional copies of this manual or other State of Minnesota manuals call the MnDOT Map & Manual Sales Unit at 651-366-3017 for current costs and ordering information. They are located at the following address:

MnDOT Map & Manual Sales Unit
395 John Ireland Blvd. - MS 260
St. Paul, Minnesota 55155-1899

Comments regarding the content of the 2011 MN MUTCD should be referred to:

Tiffany Kautz, Traffic Standards Engineer
Office of Traffic Engineering
Phone: (651) 234-7388
Email: tiffany.kautz@state.mn.us

Sincerely,

A handwritten signature in blue ink, appearing to read 'Brian Sorenson', written over a circular stamp.

Brian Sorenson, PE
State Traffic Engineer

**REVISIONS TO THE
2011 MINNESOTA UNIFORM TRAFFIC CONTROL DEVICES MANUAL
ORDER NO. 98253**

This is the seventh order revising the 2011 Minnesota Manual on Uniform Traffic Control Devices (2011 MN MUTCD).

By Order number 92452 dated December 15, 2011 and published in the State Register of December 26, 2011, the Commissioner of Transportation (Commissioner) has adopted the 2011 MN MUTCD establishing a uniform system of traffic control devices for streets and highways of the State of Minnesota as required by Minnesota Statutes, Section 169.06, Subdivision 1 (2011). The 2011 MN MUTCD correlates with and so far as possible conforms to the current system as approved by the American Association of State Highway Officials and the national Manual on Uniform Traffic Control Devices (Federal MUTCD). (Minn. Stat. § 169.06, subd. 1 (2011); Federal Highway Administration, 23 C.F.R. § 655.603 (2011).)

The Commissioner adopted revisions and changes to the 2011 MN MUTCD by Order numbers:

- 1) 93167 dated July 12, 2012 published in the State Register of July 23, 2012;
- 2) 93799 dated July 8, 2013 published in the State Register of August 5, 2013;
- 3) 94040 dated December 11, 2013 published in the State Register of December 16, 2013;
- 4) 94687 dated February 10, 2015 published in the State Register of February 17, 2015, 94687 revised April 1, 2015 published in the State Register of April 13, 2015;
- 5) 97233 dated January 30, 2018 published in the State Register of February, 12, 2018;
- 6) 97267 dated February 21, 2018 published in the State Register of March 12, 2018.

A multi-agency committee has reviewed the changes in the 2009 Federal MUTCD and recommended further revisions and additions.

Pursuant to Minnesota Statutes, Section 169.06, subd. 1 (2011), and 169.215, subd. 2 (2011), the Commissioner hereby adopts the revisions listed below:

Record of Revisions or Additions to the MN MUTCD

<u>Revision Number</u>	<u>Date Issued</u>	<u>Pages Revised or Added</u>
7	<u>12/4/19</u>	2B-i, 2B-ii, 2B-6, 2B-15, 2B-31, 2B-56, 2H-1, 2H-3, 2H-4, 2H-5, 2H-6, 2H-8, 2H-i, 2M-5, 2M-16, 6A-i, 6A-ii, 6A-iv, 6A-v, 6A-vi, 6C-2, 6D-1, 6D-2, 6D-4, 6E-1, 6E-4, 6E-8, 6E-10, 6F-1, 6F-7, 6F-12, 6F-19, 6F-27, 6F-32, 6F-33, 6G-7, 6G-9, 6G-12, 6G-14, 6J-19.

This Order revises Commissioner's Order number 92452, dated December 15, 2011 as revised by Commissioner's Orders numbers 93167 dated July 12, 2012, 93799 dated July 8, 2013, 94040 dated December 11, 2013, 94687 dated February 10, 2015, 94687 revised dated April 1, 2015, 97233 dated January 30, 2018 and 97267 dated February 21, 2018.

Signed this 4 day of December 2018.⁹


Margaret Anderson Kelliher
Commissioner of Transportation

Minnesota Manual on Uniform Traffic Control Devices

TABLE OF CONTENTS

Forward
Introduction

PART 1. GENERAL

Chapter 1A. GENERAL

PART 2. SIGNS

Chapter 2A. GENERAL
Chapter 2B. REGULATORY SIGNS
Chapter 2C. WARNING SIGNS AND OBJECT MARKERS
Chapter 2D. GUIDE SIGNS - CONVENTIONAL ROADS
Chapter 2E. GUIDE SIGNS - FREEWAYS AND EXPRESSWAYS
Chapter 2F. TOLL ROAD SIGNS
Chapter 2G. PREFERENTIAL AND MANAGED LANE SIGNS
Chapter 2H. GENERAL INFORMATION SIGNS
Chapter 2I. GENERAL SERVICE SIGNS
Chapter 2J. SPECIFIC SERVICE (LOGO) SIGNS
Chapter 2K. TOURIST-ORIENTED DIRECTIONAL SIGNS
Chapter 2L. CHANGEABLE MESSAGE SIGNS
Chapter 2M. RECREATIONAL AND CULTURAL INTEREST AREA SIGNS
Chapter 2N. EMERGENCY MANAGEMENT SIGNING

PART 3. MARKINGS

Chapter 3A. GENERAL
Chapter 3B. PAVEMENT AND CURB MARKINGS
Chapter 3C. ROUNDABOUT MARKINGS
Chapter 3D. MARKINGS FOR PREFERENTIAL LANES
Chapter 3E. MARKINGS FOR TOLL PLAZAS
Chapter 3F. DELINEATORS
Chapter 3G. COLORED PAVEMENTS
Chapter 3H. CHANNELIZING DEVICES USED FOR EMPHASIS OF PAVEMENT MARKING PATTERNS
Chapter 3I. ISLANDS
Chapter 3J. RUMBLE STRIP MARKINGS

PART 4. HIGHWAY TRAFFIC SIGNALS

Chapter 4A. GENERAL
Chapter 4B. TRAFFIC CONTROL SIGNALS - GENERAL
Chapter 4C. TRAFFIC CONTROL SIGNAL NEEDS STUDIES
Chapter 4D. TRAFFIC CONTROL SIGNAL FEATURES
Chapter 4E. PEDESTRIAN CONTROL FEATURES
Chapter 4F. PEDESTRIAN HYBRID BEACONS
Chapter 4G. TRAFFIC CONTROL SIGNALS AND HYBRID BEACONS FOR EMERGENCY VEHICLE ACCESS
Chapter 4H. TRAFFIC CONTROL SIGNALS FOR ONE-LANE, TWO-WAY FACILITIES
Chapter 4I. TRAFFIC CONTROL SIGNALS FOR FREEWAY ENTRANCE RAMPS
Chapter 4J. TRAFFIC CONTROL FOR MOVABLE BRIDGES
Chapter 4K. HIGHWAY TRAFFIC SIGNALS AT TOLL PLAZAS
Chapter 4L. FLASHING BEACONS
Chapter 4M. LANE-USE CONTROL SIGNALS
Chapter 4N. IN-ROADWAY LIGHTS
Chapter 4O. ADVANCE WARNING FLASHERS
Chapter 4P. TRAFFIC CONTROL SIGNALS FOR DIVIDED HIGHWAYS

TABLE OF CONTENTS

PART 5. TRAFFIC CONTROL DEVICES FOR LOW VOLUME ROADS

- Chapter 5A. GENERAL
- Chapter 5B. REGULATORY SIGNS
- Chapter 5C. WARNING SIGNS
- Chapter 5D. GUIDE SIGNS
- Chapter 5E. MARKINGS
- Chapter 5F. TRAFFIC CONTROL FOR HIGHWAY-RAIL GRADE CROSSINGS
- Chapter 5G. TEMPORARY TRAFFIC CONTROL ZONES
- Chapter 5H. TRAFFIC CONTROL FOR SCHOOL AREAS

PART 6. TEMPORARY TRAFFIC CONTROL

- Chapter 6A. GENERAL
- Chapter 6B. FUNDAMENTAL PRINCIPLES
- Chapter 6C. TEMPORARY TRAFFIC CONTROL ELEMENTS
- Chapter 6D. PEDESTRIAN AND WORKER SAFETY
- Chapter 6E. FLAGGER CONTROL
- Chapter 6F. TEMPORARY TRAFFIC CONTROL ZONE DEVICES
- Chapter 6G. TYPE OF TEMPORARY TRAFFIC CONTROL ZONE ACTIVITIES
- Chapter 6H. SPEED LIMITS IN TEMPORARY TRAFFIC CONTROL ZONES
- Chapter 6I. CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS
- Chapter 6J. LONG TERM TEMPORARY TRAFFIC CONTROL ZONE LAYOUTS
- Chapter 6K. SHORT TERM TEMPORARY TRAFFIC CONTROL ZONE LAYOUTS (*The Field Manual*)

PART 7. TRAFFIC CONTROLS FOR SCHOOL AREAS

- Chapter 7A. GENERAL
- Chapter 7B. SIGNS
- Chapter 7C. MARKINGS
- Chapter 7D. CROSSING SUPERVISION
- Chapter 7E. SPEED LIMITS IN SCHOOL ZONES

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

- Chapter 8A. GENERAL
- Chapter 8B. SIGNS AND MARKINGS
- Chapter 8C. FLASHING LIGHT SIGNALS, GATES, AND TRAFFIC CONTROL SIGNALS
- Chapter 8D. PATHWAY GRADE CROSSINGS

PART 9. TRAFFIC CONTROLS FOR BICYCLE FACILITIES

- Chapter 9A. GENERAL
- Chapter 9B. SIGNS
- Chapter 9C. MARKINGS
- Chapter 9D. SIGNALS

- Appendix A1 CONGRESSIONAL LEGISLATION
- Appendix A2 METRIC CONVERSIONS
- Appendix A3 RETROREFLECTIVE SHEETING IDENTIFICATION GUIDE
- Appendix C SIGN LISTING

Year	Name	Commissioner's Order Number	Month/Day/Year of Adoption	
1939	Manual on Uniform Traffic Control Devices for Streets and Highways of the State of Minnesota	12328	4/21/39	
1949	Manual on Uniform Traffic Control Devices for Streets and Highways of the State of Minnesota	19270	3/22/49	
1956	Manual on Uniform Traffic Control Devices for Streets and Highways of the State of Minnesota	25729	5/23/56	
1962	Manual on Uniform Traffic Control Devices for Streets and Highways of the State of Minnesota	32517 49894 50987	2/16/62 9/15/71 4/21/72	
1974	Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways	54014	12/20/73	
1986	Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways (MN MUTCD)	70797 71787	4/15/86 12/19/86	
1991	Minnesota Manual on Uniform Traffic Control Devices for Streets and Highways (MN MUTCD)	77588 78988 79901 80748 80878 81551 82232 82843 83387 84240 85045	10/3/91 1/4/93 2/4/94 1/6/95 4/3/95 3/15/96 1/10/97 1/2/98 11/17/99 1/26/00 12/20/00	
2001	Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD)	86252 87127 87570	4/15/02 5/22/03 1/2/04	
2005	Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD)	88522 89453 90038 90627	5/5/05 1/2/07 2/15/08 3/26/09	
2011	Minnesota Manual on Uniform Traffic Control Devices (MN MUTCD)	92952 93167 93799 94040 94687 97233 97267 98253	12/15/11 7/15/12 7/29/13 12/11/13 2/10/15 1/31/18 2/21/18 12/4/19	Rev. 1 Rev. 2 Rev. 3 Rev. 4 Rev. 5 Rev. 6 Rev. 7

Table I-1a. Evolution of the Minnesota MUTCD

GUIDANCE:

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

SUPPORT:

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).

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:

When used in this Manual, the text headings of Standard, Guidance, Option, and Support shall be as defined in the first paragraph of Section 1A.13.

SUPPORT:

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:

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.

Except when a specific numeral is required or recommended by the text of a Section of the 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:

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

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.3-Size of Regulatory Signs.

Each Section is comprised of one or more paragraphs. The paragraphs are indented but are not 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, P7, D1, A.1," and would be verbally referenced as "Item A.1 of Paragraph 1 of Section 4D.14."

STANDARD:

In accordance with 23 CFR 655.603(b)(3), Minnesota shall revise the MN MUTCD 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).

After the adoption and issuance of a new edition of the MN MUTCD or a revision thereto, new or reconstructed devices installed shall be in compliance with the new edition or revision.

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

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 MN 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 and the State of Minnesota have the authority to establish other target compliance dates for implementation of particular changes to the MN MUTCD [23 CFR 655.603(d)(1)]. These target compliance dates established by the FHWA shall be as shown in Table I-2.

RECORD OF REVISIONS OR ADDITIONS		
Revision Number	Date Issued	Pages Revised or Added
	12/15/2011	Issued as a new manual
1	6/15/2012	v, viii, ix, 1A-4, 1A-28, 1A-29, 2A-5, 2A-18, 2B-1 thru 2B-6, 2B-11, 2B-15, 2B-34, 2B-35, 2B-38, 2B-41, 2B-53, 2B-56, 2B-57, 2C-3, 2C-4, 2C-11, 2C-13, 2C-17, 2C-18, 2C-20, 2C-24 thru 2C-28, 2C-30, 2C-34, 2D-23, 2D-27 thru 2D-29, 2E-6, 2E-33, 2E-37, 2E-41, 2E-51, 2F-6, 2G-11, 2G-16, 2I-2, 2I-5, 2I-10, 2I-11, 2I-13, 2J-5, 2M-1, 2M-2, 2N-2, 3B-27, 3B-35, 4D-1, 4D-39, 4D-46, 4E-3, 4E-6, 4F-3, 5C-2, 6D-1, 6D-2, 6D-4, 6E-1, 6F-3, 6F-7, 6F-20, 6F-29, 6F-37, 6F-52, 6G-1, 7B-1, 7B-5, 7B-6, 7B-9, 7B-11, 7C-1, 7D-1, 7E-a thru 7E-21, 8B-1, 8B-3, 8B-4, 8B-7 thru 8B-10, 8B-14, 8B-18, 8C-4, 8C-8, 8C-9, 9A-i, 9A-ii, 9B-2 thru 9B-4, 9B-6, 9B-9, 9B-18, 9C-1, A2-1, C-1 thru C-8, C-15 thru C-24, C-26, C-28 thru C-31, C-33 thru C-40, C-42, C-43, C-47, C-52 thru C-60, C-62 thru C-70, C-75 thru C-77, C-79 thru C-83
2	6/29/2013	ii, vi, 2A-4, 2A-18, 2A-19, 2B-2 thru 2B-6, 2B-11, 2B-12, 2B-18, 2B-21, 2B-22, 2B-37, 2B-40, 2B-47, 2B-48, 2B-51, 2B-56, 2B-59, 2C-4, 2C-5, 2C-7, 2C-10, 2C-26, 2C-32, 2D-1, 2D-9, 2D-27, 2D-39, 2E-18, 2E-47, 2E-48, 2E-51, 2G-3, 2G-4, 2H-i, 2H-2, 2H-7 thru 2H-9, 2I-2 thru 2I-4, 2I-7, 2I-10, 2J-4, 2J-6, 2K-1, 2K-5, 2M-i, 2M-1, 2M-2, 2M-9, 2M-12 thru 2M-14, 3B-9, 4D-2, 4D-31, 4D-33, 6F-5, 6J-4, 6J-17, 7A-i, 7B-2, 7B-10, 9B-9, 9B-16, 9B-18, C-1, C-2, C-5, C-13, C-14, C-16 thru C-21, C-24, C-26 thru C-39, C-41 thru C-57, C-59 thru C-61, C-63 thru C-66, C-82 thru C-95, INDEX-9 thru INDEX-16.
3	12/11/2013	v, ix, 2B-i, 2B-17, 2B-55, 2C-ii, 2C-23, 2C-26 thru 2C-36, 2D-28, 2E-11, 3B-14, 3C-1, 4G-3, 4L-1, 6A-iii thru 6A-vi, 6F-3 thru 6F-5, 6F-14, 6F-17, 6F-19, 6F-20, 6F-40 thru 6F-53, 6G-7, 6J-iii, 6J-2, 6J-4, 6J-5, 6J-7, 6J-8, 6J-10, 6J-11, 6J-14 thru 6J-21, 6J-24a thru 6J-25b, Chapter 6K (the Field Manual) in its entirety, 7B-2, 8B-2, 9B-6, C-3, C-19, C-38, C-39, C-46, C-56 thru C-58, remove Appendix B in its entirety.
4	2/10/2015	v, ix, 2C-i, 2C-iii, 2C-5, 2C-23, 3A-i, 3A-iii, 3B-8, 3B-10, 3B-11, 3B-14, 3B-36, 6A-iii, 6A-v, 6A-vi, 6C-6, 6F-20, Chapter 6H (Speed Limits in Temporary Traffic Control Zones) in its entirety.
5	1/31/2018	Chapter 6K - Minnesota Temporary Traffic Control Field Manual (the Field Manual) in its entirety.
6	2/21/2018	1A-i, 1A-18, 2B-i, 2B-ii, 2B-iii, 2B-6, 2B-14, 2B-16, 2B-57, 2B-58, 2C-i, 2C-19, 2C-20, 2D-ii, 2D-37, 2D-38, 2M-i, 2M-13, 2M-14, 3A-i, 3A-ii, 3B-32, 3F-3, 3F-4, 4A-i, 4A-iii, 4D-1, 4I-1, 5A-ii, 5G-1, 7A-i, 7D-1, 7F-1, 8A-i, 8A-ii, 8A-iii, 8A-1, 8B-9, 8B-20, 8C-11, 8C-13, 8C-14, 8C-15, 8C-16, 8C-17, 8D-2
7	12/4/2019	v, ix, 2B-i, 2B-ii, 2B-6, 2B-15, 2B-31, 2B-56, 2H-i, 2H-1, 2H-3, 2H-4, 2H-5, 2H-6, 2H-8, 2M-i, 2M-16, 6A-i, 6A-ii, 6A-iv, 6A-v, 6A-vi, 6C-2, 6D-1, 6D-2, 6D-4, 6E-1, 6E-4, 6E-8, 6E-10, 6F-1, 6F-7, 6F-18, 6F-19, 6F-27, 6F-32, 6F-33, 6G-7, 6G-9, 6G-12, 6G-14, 6J-19

Chapter 2B. REGULATORY SIGNS
TABLE OF CONTENTS

Chapter 2B. REGULATORY SIGNS

2B.1	Application of Regulatory Signs	2B-1
2B.2	Design of Regulatory Signs	2B-1
2B.3	Size of Regulatory Signs	2B-1
2B.4	Right-of-Way at Intersections	2B-7
2B.5	STOP Sign (R1-1) and ALL WAY Plaque (R1-3P)	2B-8
2B.6	STOP Sign Applications	2B-9
2B.7	Multi-Way Stop Applications	2B-9
2B.8	YIELD Sign (R1-2)	2B-10
2B.9	YIELD Sign Applications	2B-10
2B.10	STOP Sign or YIELD Sign Placement	2B-10
2B.11	Stop Here For Pedestrians Signs (R1-5 Series)	2B-11
2B.12	In-Street and Overhead Pedestrian Crossing Signs (R1-6a, R1-6b, R1-9a, and R1-9b)	2B-12
2B.13	Speed Limit Sign (R2-1)	2B-14
2B.13.1	Bridge Speed Limit (R2-X5)	2B-16
2B.14	Truck Speed Limit Sign (R2-2P)	2B-16
2B.15	Night Speed Limit Sign (R2-3P)	2B-16
2B.16	Minimum Speed Limit Sign (R2-4P)	2B-17
2B.16.1	This section has been eliminated	
2B.16.2	End Work Speed Zone Sign (R2-6c)	2B-17
2B.17	Higher Fines Signs and Plaque (R2-6P, R2-10, and R2-11).....	2B-17
2B.18	Movement Prohibition Signs (R3-1 through R3-4, R3-18 and R3-27)	2B-18
2B.19	Intersection Lane Control Signs (R3-5 through R3-8)	2B-19
2B.20	Mandatory Movement Lane Control Signs (R3-5, R3-5a, and R3-7)	2B-20
2B.21	Optional Movement Lane Control Sign (R3-6)	2B-21
2B.22	Advance Intersection Lane Control Signs (R3-30 Series)	2B-22
2B.23	RIGHT (LEFT) LANE MUST EXIT Sign (R3-33).....	2B-22
2B.24	Two-Way Left Turn Only Signs (R3-9a, R3-9b).....	2B-22
2B.25	BEGIN and END Plaques (R3-9cP, and R3-9dP)	2B-23
2B.26	Reversible Lane Control Signs (R3-9e through R3-9i)	2B-23
2B.27	Jughandle Signs (R3-23, R3-24, R3-25, and R3-26 Series)	2B-26
2B.28	DO NOT PASS Sign (R4-1)	2B-26
2B.29	PASS WITH CARE Sign (R4-2).....	2B-30
2B.30	KEEP RIGHT EXCEPT TO PASS Sign (R4-16) and SLOWER TRAFFIC KEEP RIGHT Sign (R4-3)	2B-30
2B.31	TRUCKS USE RIGHT LANE Sign (R4-5)	2B-30
2B.32	Keep Right and Keep Left Signs (R4-7, R4-8)	2B-31
2B.33	STAY IN LANE Sign (R4-9)	2B-31
2B.33.1	DO NOT CROSS SOLID DOUBLE WHITE LINE Sign (R16-X16)	2B-31
2B.34	RUNAWAY VEHICLES ONLY Sign (R4-10)	2B-32
2B.35	Slow Vehicle Turn-Out Signs (R4-12, R4-13, and R4-14)	2B-32
2B.36	NO DRIVING ON SHOULDER Sign (R4-17a) and NO PASSING ON SHOULDER Sign (R4-18a)	2B-32
2B.37	DO NOT ENTER Sign (R5-1)	2B-33
2B.38	WRONG WAY Sign (R5-1a)	2B-33

Mn Rev. 6
Mn Rev. 6
Mn Rev. 7
Mn Rev. 3
Mn Rev. 7

2B.39	Selective Exclusion Signs	2B-33
2B.39.1	Other Selective Exclusion Signs (R5-X1)	2B-35
2B.40	ONE WAY Signs (R6-1, R6-2).....	2B-35
2B.41	Wrong-Way Traffic Control at Interchange Ramps	2B-40
2B.42	Divided Highway Crossing Signs (R6-3, R6-3a).....	2B-41
2B.43	Roundabout Directional Arrow Signs (R6-4, R6-4a, and R6-4b)	2B-41
2B.44	Roundabout Circulation Plaque (R6-5P)	2B-45
2B.45	Examples of Roundabout Signing	2B-45
2B.46	Parking, Standing, and Stopping Signs (R7 and R8 Series)	2B-45
2B.47	Design of Parking, Standing, and Stopping Signs	2B-47
2B.48	Placement of Parking, Stopping, and Standing Signs	2B-48
2B.48.1	Disabled Parking Signs (R7-8m)	2B-48
2B.49	Emergency Restriction Signs (R8-4, R8-7, R8-8, R16-X4)	2B-49
2B.50	WALK ON LEFT FACING TRAFFIC and No Hitchhiking Signs (R9-1, R9-4, R9-4a)	2B-49
2B.51	Pedestrian Crossing Signs (R9-2, R9-3)	2B-49
2B.52	Traffic Signal Pedestrian and Bicycle Actuation Signs (R10-1 through R10-4, and R10-24 through R10-26)	2B-50
2B.53	Traffic Signal Signs (R10-5 through R10-30)	2B-51
2B.54	No Turn on Red Signs (R10-11 Series, and R10-30)	2B-52
2B.55	Photo Enforced Signs and Plaques (R10-18, R10-19P, R10-19aP)	2B-53
2B.56	Ramp Metering Signs (R10-28a and R10-29a).....	2B-53
2B.57	KEEP OFF MEDIAN Sign (R11-1)	2B-54
2B.58	ROAD CLOSED Sign (R11-2) and LOCAL TRAFFIC ONLY Signs (R11-3 Series, R11-4)	2B-54
2B.58.1	Bridge Closed Signs (R11-2a and R11-3c)	2B-54
2B.58.2	Sidewalk Closed Signs (R9-9, R9-10)	2B-55
2B.59	Weight Limit Signs (R12-1 through R12-5)	2B-55
2B.59.1	Bridge and Structure Weight, Width and Height Restriction Signs (R12-1a, R12-5 Supplement, R12.X2, R12-X4, and R12-X4A)	2B-56
2B.60	Weigh Station Signs (R13 Series)	2B-57
2B.61	Truck Route Sign (R14-1)	2B-57
2B.62	Hazardous Material Signs (R14-2, R14-3)	2B-57
2B.63	National Network Signs (R14-4, R14-5)	2B-57
2B.64	Headlight Use Signs (R16-5 through R16-11)	2B-58
2B.65	FENDER BENDER Sign (R16-4)	2B-58
2B.66	Seat Belt Symbol	2B-58
2B.66.1	Other Regulatory Signs	2B-58
2B.66.2	State Law Signs (R16-X1, X2, X3, X9, X11, and X12)	2B-59
2B.67	Barricades	2B-59
2B.68	Gates	2B-59

Mn Rev. 6

Mn Rev. 6

Mn Rev. 7

Sign or Plaque	Sign Designation	Section	Conventional Road		Expressway	Freeway	Minimum	Oversized
			Single Lane	Multi-Lane				
Cross Only on Green	R10-1	2B.52	12 x 18	12 x 18	---	---	---	---
Pedestrian Signs and Plaques	R10.2, 3,3b,3c,3d,4	2B.52	9 x 12	9 x 12	---	---	---	---
Pedestrian Signs	R10-3a,3e,3f 3g,3h,3i,4a	2B.52	9 x 15	9 x 15	---	---	---	---
Left on Green Arrow Only	R10-5	2B.53	30 x 36	30 x 36	48 x 60	---	24 x 30	48 x 60
Stop Here on Red	R10-6	2B.53	24 x 36	24 x 36	---	---	---	36 x 48
Stop Here on Red	R10-6a	2B.53	24 x 30	24 x 30	---	---	---	36 x 42
Do Not Block Intersection	R10-7,7a	2B.53	30 x 30	30 x 30	---	---	---	---
Use Lane with Greed Arrow	R10-8	2B.53	36 x 42	36 x 42	36 x 42	---	---	60 x 72
Left (Right) Turn Signal	R10-10	2B.53	30 x 36	30 x 36	---	---	---	---
No Turn on Red	R10-11	2B.54	24 x 30	36 x 48	---	---	---	36 x 48
No Turn on Red	R10-11a	2B.54	30 x 36	36 x 48	---	---	---	---
No Turn on Red	R10-11b	2B.54	36 x 36	36 x 36	---	---	---	---
No Turn on Red Except from Right Lane	R10-11c	2B.54	30 x 42	30 x 42	---	---	---	---
No Turn on Red from This Lane	R10-11d	2B.54	30 x 42	30 x 42	---	---	---	---
Left Turn Yield on Green	R10-12	2B.53	30 x 36	30 x 36	36 x 48	---	---	---
Emergency Signal	R10-13	2B.53	42 x 30	42 x 30	---	---	---	---
Emergency Signal-Stop on Flashing Red	R10-14	2B.53	36 x 42	36 x 42	---	---	---	---
Emergency Signal-Stop on Flashing Red (overhead)	R10-14a	2B.53	60 x 24	60 x 24	---	---	---	---
Stop Here on Flashing Red Arrow	R10-14b	2B.53	24 x 36	24 x 36	---	---	---	36 x 48
Turning Vehicles Stop for Peds	R10-15a	2B.53	30 x 30	30 x 30	---	---	---	---
U-Turn Yield to Right Turn	R10-16	2B.53	30 x 36	30 x 36	---	---	---	---
Right on Red Arrow After Stop	R10-17a	2B.54	30 x 36	30 x 36	---	---	---	---
Traffic Laws Photo Enforced	R10-18	2B.55	36 x 24	36 x 24	48 x 30	54 x 36	---	54 x 36
Photo Enforced (symbol plaque)	R10-19P	2B.55	24 x 12	24 x 12	36 x 18	48 x 24	---	48 x 24
Photo Enforced (plaque)	R10-19aP	2B.55	24 x 18	24 x 18	36 x 30	48 x 36	---	48 x 36
Mon-Fri (and times) (3 lines) (plaque)	R10-20aP	2B.53	24 x 24	24 x 24	---	---	---	---
Sunday (and times)	R10-20aP	2B.53	24 x 18	24 x 18	30 x 24	---	---	48 x 36
Crosswalk, Stop on Red	R10-23	2B.53	24 x 30	24 x 30	---	---	---	---
Push Button to Turn on Warning Lights	R10-25	2B.52	9 x 12	9 x 12	---	---	---	---
Left Turn Yield on Flashing Red Arrow After Stop	R10-27	2B.53	30 x 36	30 x 36	---	---	---	---
XX Vehicles on Green	R10-28a	2B.56	24 x 30	24 x 30	---	---	---	---
XX Vehicles on Green Each Lane	R10-29a	2B.56	36 x 24	36 x 24	---	---	---	---
Right Turn on Red Must Yield to U-Turn	R10-30	2B.54	30 x 36	30 x 36	---	---	---	---
At Signal (plaque)	R10-31P	2B.54	24 x 9	24 x 9	---	---	---	---
Push Button for 2 Seconds for Extra Crossing Time	R10-32P	2B.52	9 x 12	9 x 12	---	---	---	---
Keep Off Median	R11-1	2B.57	24 x 30	24 x 30	---	---	---	---
Road Closed	R11-2,2a	2B.58	48 x 30	48 x 30	---	---	---	---
Road Closed - Local Traffic Only	R11-3a, 3b,3c,4	2B.58	60 x 30	60 x 30	---	---	---	---
Weight Limit	R12-1,2	2B.59	24 x 30	24 x 30	36 x 48	---	---	36 x 48
Weight Limit	R12-1a,3	2B.59	24 x 36	24 x 36	---	---	---	---
Weight Limit	R12-4	2B.59	36 x 24	36 x 24	---	---	---	---

Table 2B-1 Regulatory Sign and Plaque Sizes (Sheet 4 of 5)

Sign or Plaque	Sign Designation	Section	Conventional Road		Expressway	Freeway	Minimum	Oversized
			Single Lane	Multi-Lane				
Weight Limit	R12-5	2B.59	24 x 36	24 x 36	36 x 48	48 x 60	---	---
Restricted Bridge XX Miles Ahead Weight Limit XX Tons	R12-X2	2B.59.1	60 x 36	60 x 36	---	---	---	---
Restricted Bridge XX Miles Ahead Permit Weight Limit XX Tons	R12-X2a	2B.59.1	78 x 36	78 x 36	---	---	---	---
Trucks Must not Meet on Bridge	R12-X3	2B.59.1	36 x 24	36 x 24	---	---	---	---
Vehicles Must not Meet on Bridge	R12-X3a	2B.59.1	42 x 24	42 x 24	---	---	---	---
Restricted Bridge - XX Miles Ahead Weight Limit XX Tons, Clearance XX ft XX inches	R12-X4	2B.59.1	60 x 42	60 x 42	---	---	---	---
Restricted Bridge - XX Miles, Clearance XX ft XX inches	R12-X4a	2B.59.1	60 x 36	60 x 36	---	---	---	---
Trucks & Combinations over 10,000 lbs Must Enter Weight Station When Flashing	R13-X1	2B.60	114 x 60	114 x 60	156 x 78	192 x 96	---	---
Truck Route	R14-1	2B.61	24 x 18	24 x 24 24 x 18	---	---	---	---
Hazardous Material	R14-2,3	2B.62	24 x 24		30 x 30	36 x 36	---	42 x 42
National Network	R14-4,5	2B.63	30 x 30	30 x 30	36 x 36	36 x 36	---	42 x 42
Fender Bender Move Vehicles	R16-4	2B.65	36 x 24	36 x 24	48 x 36	60 x 48	---	48 x 36
Lights on When Using Wipers or Raining	R16-5,6	2B.64	24 x 30	24 x 30	36 x 48	48 x 60	---	36 x 48
Turn On Headlights Next XX Miles	R16-7	2B.64	48 x 15	48 x 15	72 x 24	96 x 30	---	72 x 24
Turn On, Check Headlights	R16-8,9	2B.64	30 x 15	30 x 15	48 x 24	60 x 30	---	48 x 24
Begin, End Daylight Headlight Section	R16-10,11	2B.64	48 x 15	48 x 15	72 x 24	96 x 30	---	72 x 24
State Law - Stop for School Bus when Red Lights Flashing	R16-X1	2B.66.2	72 x 48	72 x 48	72 x 48	---	---	---
State Law - Trucks and Vehicles with Trailers must Maintain 500 ft Interval	R16-X2	2B.66.2	78 x 48	78 x 48	78 x 48	78 x 48	---	---
Up to \$700 Fine for Littering Highways	R16-X3	2B.66.2	48 x 30	48 x 30	48 x 30	48 x 30	---	---
Emergency Stopping Only-Pedestrians, Bicycles, Motorized Bicycles, Non-Motorized Traffic Prohibited	R16-X4	2B.49	---	---	36 x 36	36 x 36	---	---
Signal Your Turn	R16-X6	2B.66.1	30 x 30	30 x 30	---	---	---	48 x 48
Right (Left) Lane Must Exit	R16-X7	2B.20	48 x 60	48 x 60	---	---	---	---
Rest Stop X Hr Limit - No Camping	R16-X8	2B.66.1	30 x 18	30 x 18	---	---	---	36 x 24
State Law - Unlawful to Pass on Shoulder	R16-X9	2B.66.2	60 x 48	60 x 48	---	---	---	---
No Fishing from Bridge	R16-X10	2B.66.1	18 x 24	18 x 24	---	---	---	24 x 30
State Law - Seat Belt Use Required	R16-X11	2B.66.2	72 x 36	72 x 36	72 x 36	72 x 36	---	---
Seat Belt (symbol) Fastened ?	R16-X12	2B.66.1	18 x 18	18 x 18	---	---	---	36 x 36
Vehicle Noise Laws Enforced	R16-X13	2B.66.1	24 x 24	24 x 24	---	---	---	36 x 42
State Law - Move Over for Stopped Emergency and Maintenance Vehicles	R16-X15	2B.66.2	---	132 x 78	132 x 78	132 x 78	---	---
Do Not Cross Solid Double White Line	R16-X16	2B.33.1	30 x 48	30 x 48	48 x 66	48 x 66	---	48 x 66
Check Your Turn Signal	R16-X33	2B.66.1	24 x 30	24 x 30	---	---	---	---

* See Table 9B-1 for minimum size required for signs on bicycle facilities,

Notes:

1. Larger signs may be used when appropriate
2. Dimensions in inches are shown as width x height

Table 2B-1 Regulatory Sign and Plaque Sizes (Sheet 5 of 5)

Mn Rev. 6

Mn Rev. 6
Mn Rev. 2

Mn Rev. 7
Mn Rev. 2

Mn Rev. 2

Mn Rev. 2

Mn Rev. 2

Support

Minnesota Statute 169.14 sets forth the processes to establish speed zones and speed limits on all roadways and alleys in the state.

Guidance

A Reduced Speed Limit Ahead (W3-5 or W3-5a) sign (see Section 2C.38) should be used to inform road users of a reduced speed zone where the speed limit is being reduced by more than 10 mph, or where engineering judgment indicates the need for advance notice to comply with the posted speed limit ahead.

States and local agencies should conduct engineering studies to reevaluate non-statutory speed limits on segments of their roadways that have undergone significant changes since the last review, such as the addition or elimination of parking or driveways, changes in the number of travel lanes, or changes in the configuration of bicycle lanes.

No more than three speed limits should be displayed on any one Speed Limit sign or assembly.

When a speed limit within a speed zone is posted, it should be within 5 mph of the 85th-percentile speed of free-flowing traffic.

Speed studies for signalized intersection approaches should be taken outside the influence area of the traffic control signal, which is generally considered to be approximately 1/2 mile, to avoid obtaining skewed results for the 85th-percentile speed.

Standard

A Speed Limit sign shall not be used to warn road users of an advisory speed for certain roadway conditions. See Section 2C.8 for use of advisory speed plaques.

Option

Other factors that may be considered when establishing speed limits are the following:

- A. Road characteristics, shoulder condition, grade, alignment, and sight distance;
- B. The pace speed;
- C. Roadside development and environment;
- D. Parking practices and pedestrian activity; and
- E. Reported crash experience for at least a 12-month period.

Two types of Speed Limit signs may be used: one to designate passenger car speeds, including any nighttime information or minimum speed limit that might apply; and the other to show any special speed limits for trucks and other vehicles.

A changeable message sign that changes the speed limit for traffic and ambient conditions may be installed provided

that the appropriate speed limit is displayed at the proper times.

A changeable message sign that displays to approaching drivers the speed at which they are traveling may be installed in conjunction with a Speed Limit sign.

Guidance

If a changeable message sign displaying approach speeds is installed, the legend YOUR SPEED XX MPH or such similar legend should be displayed. The color of the changeable message legend should be a yellow legend on a black background or the reverse of these colors.

Reduced Speed Ahead Signs (R2-5 series)

Standard

The Reduced Speed Ahead signs shall be removed and replaced with Speed Reduction signs (W3-5, W3-5a), see Section 2C.38.



R2-5a



R2-5b



R2-5c



R2-X1

Mn Rev. 7

Mn Rev. 1

Support

Advisory Speed signs and plaques are discussed in Sections 2C.8 and 2C.14. Temporary Traffic Control Zone Speed signs are discussed in Part 6. The WORK ZONE (G20-5aP) plaque intended for installation above a Speed Limit sign is discussed in Section 6F.12. School Speed Limit signs are discussed in Section 7B.15.

2B.13.1 Bridge Speed Limit (R2-X5)



R2-X5

Standard

The BRIDGE SPEED LIMIT sign shall be used and installed:

1. When it has been determined by the Commissioner of Transportation that it is necessary to limit the speed of vehicles on a bridge or other elevated structure constituting part of a highway to the maximum speed which can be maintained with safety on such bridge or structure,
2. Suitable signs stating such maximum speed shall be erected and maintained at a distance of 100 feet before each end of the structure.

A Bridge Speed Limit shall become effective when the Bridge Speed Limit signs are installed.

Guidance

A Speed Reduction (W3-5a) sign should be used in advance of the BRIDGE SPEED LIMIT sign.

Support

On roads maintained by MnDOT, the MnDOT Office of Bridges and Structures determines when a reduced speed limit is required on a bridge or other elevated structure constituting part of a highway. They inform the appropriate MnDOT district traffic engineer of their findings. It is the responsibility of the district traffic engineer to prepare a Speed Limit Authorization Form and submit it to the Office of Traffic Engineering (OTE).

Option

Local road authorities may submit a request stating their engineering findings to the local MnDOT district traffic engineer. A report is then prepared and submitted along with recommendations to OTE.

2B.14 Truck Speed Limit Sign (R2-2P)



R2-2P

Standard

Where a special speed limit applies to trucks or other vehicles, the legend TRUCKS XX or such similar legend shall be displayed below the legend Speed Limit XX on the same sign or on a separate R2-2P plaque below the Speed Limit sign.

2B.15 Night Speed Limit Sign (R2-3P)



R2-3P

Standard

Where different speed limits are authorized for day and night, both limits shall be posted.

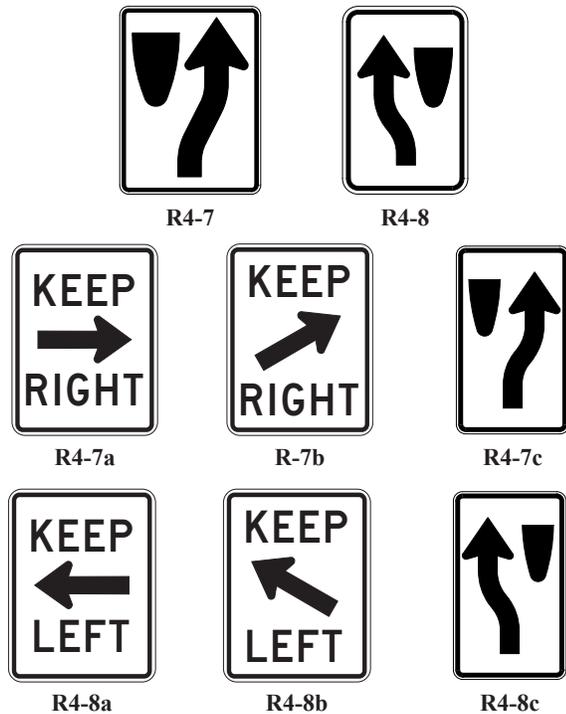
Guidance

A Night Speed Limit (R2-3P) plaque should be reversed using a white retroreflectorized legend and border on a black background.

Option

A Night Speed Limit sign may be combined with or installed below the standard Speed Limit (R2-1) sign.

2B.32 Keep Right and Keep Left Signs (R4-7, R4-8)



Option

The Keep Right (R4-7) sign may be used at locations where it is necessary for traffic to pass only to the right-hand side of a roadway feature or obstruction. The Keep Left (R4-8) sign may be used at locations where it is necessary for traffic to pass only to the left-hand side of a roadway feature or obstruction.

Guidance

At locations where it is not readily apparent that traffic is required to keep to the right, a Keep Right sign should be used.

If used, the Keep Right sign should be installed as close as practical to approach ends of raised medians, parkways, islands, and underpass piers. The sign should be mounted on the face of or just in front of a pier or other obstruction separating opposite directions of traffic in the center of the highway such that traffic will have to pass to the right-hand side of the sign.

Standard

The Keep Right sign shall not be installed on the right hand side of the roadway in a position where traffic must pass to the left-hand side of the sign.

Option

The Keep Right sign may be omitted at intermediate ends of divisional islands and medians.

Word message KEEP RIGHT (LEFT) with an arrow (R4-7a or R4-7b) signs may be used instead of the R4-7 or R4-8 symbol signs.

Where the obstruction obscures the Keep Right sign, the minimum placement height may be increased for better sign visibility.

A narrow Keep Right (R4-7c) sign may be installed on the approach end of a median island that is less than 4 feet wide at the point where the sign is to be located.

Standard

A narrow Keep Right (R4-7c) sign shall not be installed on a median island that has a width of 4 feet or more at the point where the sign is to be located.

2B.33 STAY IN LANE Sign (R4-9)



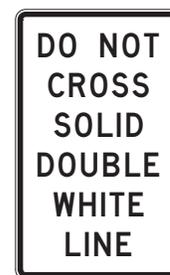
Option

A STAY IN LANE (R4-9) sign may be used on multi-lane highways to direct road users to stay in their lane until conditions permit shifting to another lane.

Guidance

If a STAY IN LANE sign is used, it should be accompanied by a double solid white lane line(s) to prohibit lane changing.

2B.33.1 DO NOT CROSS SOLID DOUBLE WHITE LINE Sign (R16-X16)



R16-X16

Option

A DO NOT CROSS SOLID DOUBLE WHITE SIGN (R16-X16) sign may be used on multi-lane highways to direct road users to stay in their lane until conditions permit shifting to another lane.

Mn Rev. 7

2B.34 RUNAWAY VEHICLES ONLY Sign (R4-10)

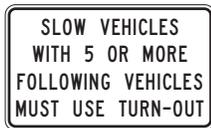


R4-10

Guidance

A RUNAWAY VEHICLES ONLY (R4-10) sign should be installed near a truck escape (or runaway truck) ramp entrance to discourage other road users from entering the ramp.

2B.35 Slow Vehicle Turn-Out Signs (R4-12, R4-13, and R4-14)



R4-12



R4-13



R4-14

Support

On two-lane highways in areas where traffic volumes and/or vertical or horizontal curvature make passing difficult, turn-out areas are sometimes provided for the purpose of giving a group of faster vehicles an opportunity to pass a slow-moving vehicle.

Option

A SLOW VEHICLES WITH XX OR MORE FOLLOWING VEHICLES MUST USE TURN-OUT (R4-12) sign may be installed in advance of a turn-out area to inform drivers who are driving so slow that they have accumulated a specific number of vehicles behind them that they are required by the traffic laws of that State to use the turn-out to allow the vehicles following them to pass.

Support

The specific number of vehicles displayed on the R4-12 sign provides law enforcement personnel with the information they need to enforce this regulation.

Option

If an R4-12 sign has been installed in advance of a turnout area, a SLOW VEHICLES MUST USE TURN-OUT AHEAD (R4-13) sign may also be installed downstream from the R4-12 sign, but upstream from the turn-out area, to remind slow drivers that they are required to use a turn-out that is a short distance ahead.

Standard

If an R4-12 sign has been installed in advance of a turnout area, a SLOW VEHICLES MUST TURN OUT (with arrow) (R4-14) sign shall be installed at the entry point of the turn-out area.

Support

Section 2D.52 contains information regarding advance information signs for slow vehicle turn-out areas.

2B.36 NO DRIVING ON SHOULDER Sign (R4-17a) and NO PASSING ON SHOULDER Sign (R4-18a)



R4-17a



R4-18a

Option

The NO DRIVING ON SHOULDER (R4-17a) sign may be installed to inform road users that using the shoulder of a roadway as a travel lane is prohibited.

The NO PASSING ON SHOULDER (R4-18a) sign may be installed to inform road users that using the shoulder of a roadway to pass other vehicles is prohibited.

A STATE LAW plaque (R4-X5) may be installed above these signs to remind road users that the regulation applies at all locations.

2B.58.2 Sidewalk Closed Signs (R9-9, R9-10)

Min Rev. 3



R9-9



R9-10

Guidance

The Sidewalk Closed signs should be used where pedestrian flow is restricted or rerouted due to road work. The SIDEWALK CLOSED sign (R9-9) should be installed at the beginning of the closed sidewalk section and elsewhere along the closed section as needed. The SIDEWALK CLOSED USE OTHER SIDE sign (R9-10) should be installed at the beginning of the restricted sidewalk section when a parallel sidewalk exists on the other side of the roadway.

These signs are typically installed on a barricade device to act as a reminding message to encourage compliance.

2B.59 Weight Limit Signs (R12-1 through R12-5)



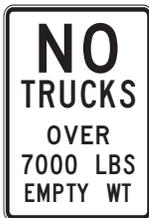
R12-1



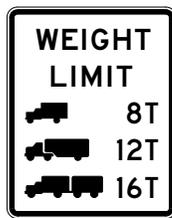
R12-2



R12-4



R12-3



R12-5

Option

The Weight Limit (R12-1) sign carrying the legend WEIGHT LIMIT XX TONS may be used to indicate vehicle weight restrictions including load.

Where the restriction applies to axle weight rather than gross load, the legend may be AXLE WEIGHT LIMIT XX TONS or AXLE WEIGHT LIMIT XXXX LBS (R12-2).

To restrict trucks of certain sizes by reference to empty weight in residential areas, the legend may be NO TRUCKS OVER XX TONS EMPTY WT or NO TRUCKS OVER XX LBS EMPTY WT (R12-3).

In areas where multiple regulations of the type described in the three previous paragraphs are applicable, a sign combining the necessary messages on a single sign may be used, such as WEIGHT LIMIT XX TONS PER AXLE, XX TONS GROSS (R12-4).

Posting of specific load limits may be accomplished by use of the Weight Limit symbol sign (R12-5). A sign containing the legend WEIGHT LIMIT on the top two lines, and showing three different truck symbols and their respective weight limits for which restrictions apply may be used, with the weight limits displayed to the right of each symbol as XX T. A bottom line of legend stating GROSS WT may be included if needed for enforcement purposes.

Standard

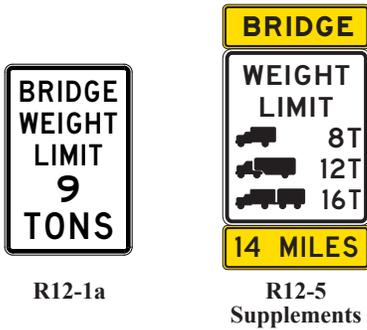
If used, the Weight Limit sign shall be located in advance of the applicable section of highway or structure.

If used, the Bridge Weight Limit sign (R12-5) shall be installed on or immediately in advance of bridges or bridge structures where it is necessary to limit the load permitted on that structure. The proper weights to display on the sign shall be based on an engineering study.

Guidance

If used, the Weight Limit sign with an advisory distance ahead legend should be placed at approach road intersections or other points where prohibited vehicles can detour or turn around.

2B.59.1 Bridge and Structure Weight, Width and Height Restriction Signs (R12-1a, R12-5 Supplement, R12-X2, R12-X4, and R12-X4A)



Standard

These signs shall be installed in advance of bridges or structures where it is necessary to limit the weight permitted on the bridge or structure and/or to show the clearance available on or below the bridge or structure:

1. BRIDGE WEIGHT LIMIT (x) TONS (R12-1a)
2. BRIDGE - WEIGHT LIMIT (w/symbols) - xx MILES (R12-5 Supplement)
3. RESTRICTED BRIDGE (xx) MILES AHEAD WEIGHT LIMIT (X) TONS (R12-X2)
4. RESTRICTED BRIDGE (xx) MILES AHEAD PERMIT WEIGHT LIMIT (X) TONS (R12-X2a)
5. RESTRICTED BRIDGE (xx) MILES AHEAD WEIGHT LIMIT (X) TONS - CLEARANCE (xx) FT. (XX) IN. (R12-X4)
6. RESTRICTED BRIDGE (xx) MILES AHEAD CLEARANCE (xx) FT. (xx) IN. (R12-X4a)

The weights to display on the sign shall be the same weights displayed on the Bridge Weight Limit sign (see Section 2B.59).

Guidance

These signs should also be placed at the nearest intersecting roadway where a motorist can detour around the restriction or at wide point in the roadway so that the motorist can turn around to avoid the restriction.

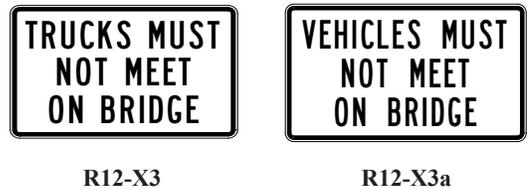
Standard

When a bridge is restricted for specific load limits, the Weight Limit symbol sign (R12-5) shall be installed immediately in advance of the bridge.

The R12-5 Supplement combination sign consists of a BRIDGE plaque installed above and a (xx) MILES plaque installed below the Weight Limit symbol sign to present a message to the motorist that is consistent with the advance warning sign assembly.

Both plaques shall have a black legend on a yellow reflectorized background. The length of the plaques shall match that of the Weight Limit symbol sign.

When a restriction on a bridge applies to the gross load of a vehicle, the BRIDGE WEIGHT LIMIT sign (R12-1a) shall be installed immediately in advance of the bridge. If an advance warning sign is to be used, the (xx) MILES plaque of the R12-5 Supplement sign combination shall be installed below the R12-1a sign. The plaque shall have a black legend on a yellow reflectorized background and shall match the length of the R12-1a sign.



Guidance

The TRUCKS MUST NOT MEET ON BRIDGE sign (R12-X3) should be installed on two-way roadways in advance of bridges or structures:

1. Where the clear opening width is greater than 18 feet and less than 20 feet, the approach alignment is poor and the structure type is such that commercial vehicles cannot pass safely on the structure, or
2. Where a restriction on the meeting or passing of commercial vehicles would provide increased load capacity upon the structure.

The VEHICLES MUST NOT MEET ON BRIDGE sign (R12-X3a) should be installed on two-way roadways in advance of one-lane bridges or structures where the clear opening width is less than 16 feet.

Mn Rev. 2

Mn Rev. 2

Mn Rev. 1
Mn Rev. 7

PART 2. SIGNS

Chapter 2H. General Information Signs

TABLE OF CONTENTS

Chapter 2H. GENERAL INFORMATION SIGNS

2H.1	Sizes of General Information Signs	2H-1
2H.2	General Information Signs (I Series)	2H-1
2H.2.1	This section has been deleted	
2H.2.2	This section has been deleted	
2H.2.3	This section has been deleted	
2H.3	Traffic Signal Speed Sign (I1-1)	2H-4
2H.4	Miscellaneous Information Signs	2H-5
2H.5	Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a).....	2H-5
2H.6	Enhanced Reference Location Signs (D10-4, D10-5)	2H-6
2H.7	Auto Tour Route Signs	2H-7
2H.7.1	This section has been deleted	
2H.8	Acknowledgment Signs	2H-8

Mn Rev. 7
Mn Rev. 7

TABLES

Table 2H-1	General Information Sign Sizes	2H-2
------------	--------------------------------------	------

PART 2. SIGNS

Chapter 2H. General Information Signs

2H.1 Sizes of General Information Signs

Standard

Except as provided in Section 2A.11, the sizes of General Information signs that have a standardized design shall be as shown in Table 2H-1.

Support

Section 2A.11 contains information regarding the applicability of the various columns in Table 2H-1.

Option

Signs larger than those shown in Table 2H-1 may be used (see Section 2A.11).

2H.2 General Information Signs (I Series)

Support

Of interest to the traveler, though not directly necessary for guidance, are numerous kinds of information that can properly be conveyed by General Information signs or miscellaneous information signs (see Section 2H.4). They include such items as State lines, city limits, other political boundaries, time zones, stream names, elevations, landmarks, and similar items of geographical interest, and safety and transportation-related messages. Chapter 2M contains recreational and cultural interest area symbol signs that are sometimes used in combination with General Information signs.

Guidance

General Information signs should not be installed within a series of guide signs or at other equally critical locations, unless there are specific reasons for orienting the road user or identifying control points for activities that are clearly in the public interest. On all such signs, the designs should be simple and dignified, devoid of any advertising, and in general compliance with other guide signing.

Standard

Except for political boundary signs, General Information signs shall have white legends and borders on green rectangular-shaped backgrounds.

When a sign is used to display a safety or transportation-related message, the display format shall not be of a type that would be considered similar to advertising displays. Messages and symbols that resemble any official traffic control device shall not be used on safety or transportation related message signs.



I-5



I-6



I-12



I-7



I-8



I-9

Mn Rev. 7

Option

An information symbol sign may be used to identify a route leading to a transportation or general information facility, or to provide additional guidance to the facility. The symbol sign may be supplemented by an educational plaque where necessary; also, the name of the facility may be used if needed to distinguish between similar facilities.



M5-1



M5-2



M6-1



M6-2



M6-3

The Advance Turn (M5 series) or Directional Arrow (M6 series) auxiliary signs with white arrows on green backgrounds may be used with General Information symbol signs to create a General Information Directional Assembly.

Guide signs for commercial service airports and non-carrier airports may be provided from the nearest Interstate, other freeway, expressway or conventional highway intersection directly to the airport, normally not to exceed 15 miles. These airports are normally signed with a legend containing the airport name and the appropriate directional message or arrow.

Mn Rev. 7
Mn Rev. 2

Sign	Sign Designation	Section	Conventional Road	Freeway or Expressway
Airport w/arrow	D1-X4	2H.2	48 x 12	60 x 18
Recycle Center w/logo and arrow	D1-X6	2H.2	78 x 36	108 x 48
Reference Location (1 digit)	D10-1	2H.5	10 x 18	12 x 24
Intermediate Reference Location (2 digits)	D10-1a	2H.5	10 x 27	12 x 36
Reference Location (2 digits)	D10-2	2H.5	10 x 27	12 x 36
Intermediate Reference Location (3 digits)	D10-2a	2H.5	10 x 36	12 x 48
Reference Location (3 digits)	D10-3	2H.5	10 x 36	12 x 48
Intermediate Reference Location (4 digits)	D10-3a	2H.5	10 x 48	12 x 60
Enhanced Reference Location	D10-4	2H.6	18 x 54	18 x 54
Intermediate Enhanced Reference Location	D10-5	2H.6	18 x 60	18 x 60
Signals Set for XX MPH	I1-1	2H.3	24 x 36	---
Adopt-A-Highway	I1-X1	2H.8	60 x 36	60 x 36
City Name Marker (1 line name)	I2-3	2H.4	Varies x 24	Varies x 36
City Name Marker (2 line names)	I2-3	2H.4	Varies x 36	Varies x 48
County Name Marker	I2-5	2H.4	Varies x 24	Varies x 36
Lake and Stream Name (1 line name)	I3-1	2H.4	Varies x 18	Varies x 24
Lake and Stream Name (2 line names)	I3-1	2H.4	Varies x 24	Varies x 36
Airport	I-5	2H.2	24 x 24	30 x 30
Bus Station	I-6	2H.2	24 x 24	30 x 30
Train Station	I-7	2H.2	24 x 24	30 x 30
Library	I-8	2H.2	24 x 24	30 x 30
Vehicle Ferry Terminal	I-9	2H.2	24 x 24	30 x 30
Recycle Collection Center	I-11	2H.2	30 x 48	---
Light Rail Transit Station	I-12	2H.2	24 x 24	---

Mn Rev. 7

Notes:

1. Larger signs may be used when appropriate, except for the D14 series signs
2. Dimensions in inches are shown as width x height

Table 2H-1 General Information Sign Sizes



Example of direction assembly

The Airport (I-5) symbol sign along with a supplemental plaque may be used to indicate the specific name of the airport. An Airport symbol sign, with or without a supplemental name plaque or the word AIRPORT, and an arrow may be used as a trailblazer.



D1-X4

Standard

Adequate trailblazer signs shall be in place prior to installing the airport guide signs.

Support

Location and placement of all airport guide signs depends upon the availability of longitudinal spacing on highways.



I-11m



D1-X6

Option

The Recycling Collection Center (I-11) symbol sign may be used to direct road users to recycling collection centers.

Support

Minnesota Statute 1115A.555 defines criteria used to designate recycling centers. Minnesota Statute 173.086 provides information on recycling center signs.

Guidance

The Recycling Collection Center symbol sign should not be used on freeways and expressways.

Standard

If used on freeways or expressways, the Recycling Collection Center symbol sign shall be considered one of the supplemental sign destinations.

Option

The pictograph of a political jurisdiction (such as a State, county, or municipal corporation) may be displayed on a political boundary General Information sign.

Standard

If used, the height of a pictograph on a political boundary General Information sign shall not exceed two times the height of the upper-case letters of the principal legend on the sign. The pictograph shall comply with the provisions of Section 2A.6.

2H.3 Traffic Signal Speed Sign (I1-1)



I1-1

Option

The Traffic Signal Speed (I1-1) sign, reading SIGNALS SET FOR XX MPH, may be used to indicate a section of street or highway on which the traffic control signals are coordinated into a progressive system timed for a specified speed at all hours during which they are operated in a coordinated mode.

If different system progression speeds are set for different times of the day, a changeable message element may be used for the numerals of the Traffic Signal Speed (I1-1) sign. If the system is operated in coordinated mode only during certain times, a blank-out version of the Traffic Signal Speed (I1-1) sign may be used to display the message only during those times.

Guidance

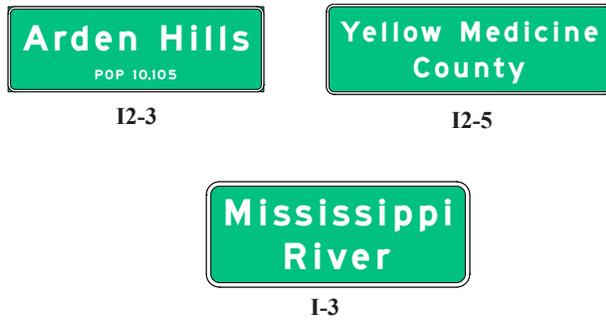
If used, the sign should be mounted as near as practical to each intersection where the timed speed changes, and at intervals of several blocks throughout any section where the timed speed remains constant.

Standard

The Traffic Signal Speed sign shall be a minimum of 24 x 36 inches with the longer dimension vertical. It shall have a white message and border on a green background.

Section Intentionally Left Blank

2H.4 Miscellaneous Information Signs



Support

Miscellaneous information signs are used to point out geographical features, such as rivers and summits, and other jurisdictional boundaries (see Section 2H.2).

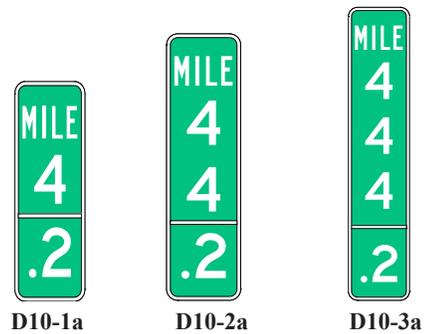
Option

Miscellaneous information signs may be used if they do not interfere with signing for interchanges or other critical points.

Guidance

Miscellaneous information signs should not be installed unless there are specific reasons for orienting the road users or identifying control points for activities that are clearly in the public interest. If Miscellaneous information signs are to be of value to the road user, they should be consistent with other guide signs in design and legibility. On all such signs, the design should be simple and dignified, devoid of any tendency toward flamboyant advertising, and in general compliance with other signing.

2H.5 Reference Location Signs (D10-1 through D10-3) and Intermediate Reference Location Signs (D10-1a through D10-3a)



Support

There are two types of reference location signs:

- Reference Location (D10-1, 2, and 3) signs show an integer distance point along a highway, and
- Intermediate Reference Location (D10-1a, 2a, and 3a) signs also show a decimal between integer distance points along a highway.

Standard

Except when Enhanced Reference Location signs (see Section 2H.6) are used instead, Reference Location (D10-1 through D10-3) signs shall be placed on all expressway facilities that are located on a route where there is reference location sign continuity and on all freeway facilities to assist road users in estimating their progress, to provide a means for identifying the location of emergency incidents and traffic crashes, and to aid in highway maintenance and servicing.

Option

Reference Location (D10-1 to D10-3) signs may be installed along any section of a highway route or ramp to assist road users in estimating their progress, to provide a means for identifying the location of emergency incidents and traffic crashes, and to aid in highway maintenance and servicing.

To augment the reference location sign system, Intermediate Reference Location (D10-1a to D10-3a) signs which show the tenth of a mile with a decimal point, may be installed at one tenth of a mile intervals, or at some other regular spacing.

Standard

When Intermediate Reference Location (D10-1a to D10-3a) signs are used to augment the reference location sign system, the reference location sign at the integer mile point shall display a decimal point and a zero numeral.

When placed on freeways or expressways, reference location signs shall contain 10-inch white numerals on a 12-inch wide green background with a white border. The signs shall be 24, 36, or 48 inches in height for one, two, or three digits, respectively, and shall contain the word MILE in 4-inch white letters.

When placed on conventional roads, reference location signs shall contain 6-inch white numerals on a green background that is at least 10 inches wide with a white border. The signs shall contain the word MILE in 4-inch white letters.

Reference location signs shall have a minimum mounting height of 4 feet, measured vertically from the bottom of the sign to the elevation of the near edge of the roadway, and shall not be governed by the mounting height requirements prescribed in Section 2A.18.

The distance numbering shall be continuous for each route within a State, except where overlaps occur (see Section 2E.31). Where routes overlap, reference location sign continuity shall be established for only one of the routes. If one of the overlapping routes is an Interstate route, that route shall be selected for continuity of distance numbering.

Guidance

The route selected for continuity of distance numbering should also have continuity in interchange exit numbering (see Section 2E.31).

On a route without reference location sign continuity, the first reference location sign beyond the overlap should indicate the total distance traveled on the route so that road users will have a means of correlating their travel distance between reference location signs with that shown on their odometer.

Standard

For divided highways, the distance measurement shall be made on the northbound and eastbound roadways. The reference location signs for southbound or westbound roadways shall be set at locations directly opposite the reference location signs for the northbound or eastbound roadways.

Guidance

Zero distance should begin at the south and west State lines, or at the south and west terminus points where routes begin within a State.

Standard

Except as provided in the Option below, reference location signs shall be installed on the right-hand side of the roadway.

Option

Where conditions limit or restrict the use of reference location signs on the right-hand side of the roadway, they may be installed in the median. On two-lane conventional roadways, reference location signs may be installed on one side of the roadway only and may be installed back-to-back. Reference location signs may be placed up to 30 feet from the edge of the pavement.

If a reference location sign cannot be installed in the correct location, it may be moved in either direction as much as 50 feet.

Guidance

If a reference location sign cannot be placed within 50 feet of the correct location, it should be omitted.

2H.6 Enhanced Reference Location Signs (D10-4, D10-5)



D10-4



D10-5

Support

There are two types of enhanced reference location signs:

- A. Enhanced Reference Location signs (D10-4), and
- B. Intermediate Enhanced Reference Location signs (D10-5).

Option

Enhanced Reference Location (D10-4) signs which enhance the reference location sign system by identifying the route, may be placed on freeways or expressways (instead of Reference Location signs) or on conventional roads.

To augment an enhanced reference location sign system, Intermediate Enhanced Reference Location (D10-5) signs which show the tenth of a mile with a decimal point, may be installed along any section of a highway route or ramp at one tenth of a mile intervals, or at some other regular spacing.

Standard

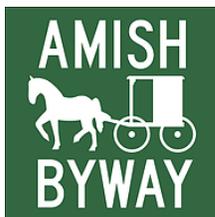
If enhanced reference location signs are used, they shall be vertical signs having blue or green backgrounds with white numerals, letters, and borders, except for the route shield, which shall be the standard color and shape. The top line shall consist of the cardinal direction for the roadway. The second line shall consist of the applicable route shield for the roadway. The third line shall identify the mile reference for the location and the bottom line of the Intermediate Enhanced Reference Location sign shall give the tenth of a mile reference for the location. The bottom line of the Intermediate Enhanced Reference Location sign shall contain a decimal point. The height of the legend on enhanced reference location signs shall be a minimum of 6 inches. The height of the route shield on enhanced reference location signs shall be a minimum of 12 inches.

The background color shall be the same for all enhanced reference location signs within a jurisdiction.

Support

The provisions in Section 2H.5 regarding mounting height, distance numbering and measurements, sign continuity, and placement with respect to the right-hand shoulder and/or median for reference location signs also apply to enhanced reference location signs.

2H.7 Auto Tour Route Signs



Support

Auto Tour Route signs are informational signs, plaques, or shields designed to provide road users with route guidance in following an auto tour route of particular cultural, historical, or educational significance.

Signed auto tour routes are used in some cases to generally follow the historical route of a trail, such as the National Historic Trails administered by the National Park Service. Examples include auto tour routes that parallel the Lewis and Clark National Historic Trail, the Oregon National Historic Trail, and the Santa Fe National Historic Trail.

Guidance

If shields or other similar signs are used to provide route guidance in following an auto tour route, they should be designed in accordance with the sizes and other design principles for route signs, such as those described in Sections 2D.10 through 2D.12.

Option

Auto Tour Route signs may be installed on a highway if they have been approved by the appropriate transportation agency.

Standard

Auto Tour Route signs shall not be installed on freeways or expressways, except as necessary to provide continuity between discontinuous segments of conventional roadways that are designated as auto tour routes, for which the freeway or expressway provides the only connection between the segments. If installed on freeways or expressways, Auto Tour Route signs shall be installed as independent trailblazer assemblies (see Sections 2D.35 and 2E.27) and shall not be installed with other Route signs or confirmation assemblies or on guide signs. If installed on freeways or expressways, Auto Tour Route trailblazer assemblies shall be installed at less frequent intervals than route confirmation assemblies.

Mn Rev. 2

2H.8 Acknowledgment Signs



11-X1

Support

Acknowledgment signs are a way of recognizing a company, business, or volunteer group that provides a highway-related service. Acknowledgment signs include sponsorship signs for adopt-a-highway litter removal programs, maintenance of a parkway or interchange, and other highway maintenance or beautification sponsorship programs.

Guidance

A State or local highway agency that elects to have an acknowledgment sign program should develop an acknowledgment sign policy. The policy should require that eligible sponsoring organizations comply with State laws prohibiting discrimination based on race, religion, color, age, sex, national origin, and other applicable laws. The acknowledgment sign policy should include all of the provisions regarding sign placement and sign design that are described in this Section.

Standard

Because regulatory, warning, and guide signs have a higher priority, acknowledgment signs shall only be installed where adequate spacing is available between the acknowledgment sign and other higher priority signs. Acknowledgment signs shall not be installed in a position where they would obscure the road users' view of other traffic control devices.

Acknowledgment signs shall not be installed at any of the following locations:

- A. On the front or back of, adjacent to, or around any other traffic control device, including traffic signs, highway traffic signals, and changeable message signs;
- B. On the front or back of, adjacent to, or around the supports or structures of other traffic control devices, or bridge piers; or
- C. At key decision points where a road user's attention is more appropriately focused on other traffic control devices, roadway geometry, or traffic conditions, including exit and entrance ramps, intersections, grade crossings, toll plazas, temporary traffic control zones, and areas of limited sight distance.

Section Intentionally Left Blank

Guidance

The minimum spacing between acknowledgment signs and any other traffic control signs, except parking regulation signs, should be:

- A. 150 feet on roadways with speed limits of less than 30 mph,
- B. 200 feet on roadways with speed limits of 30 to 45 mph, and
- C. 500 feet on roadways with speed limits greater than 45 mph.

If the placement of a newly-installed higher-priority traffic control device, such as a higher-priority sign, a highway traffic signal, or a temporary traffic control device, conflicts with an existing acknowledgment sign, the acknowledgment sign should be relocated, covered, or removed.

Option

State or local highway agencies may develop their own acknowledgment sign designs and may also use their own pictograph (see definition in Section 1A.13) and/or a brief jurisdiction-wide program slogan as part of any portion of the acknowledgment sign, provided that the signs comply with the provisions for shape, color, and lettering style in this Chapter and in Chapter 2A.

Guidance

Acknowledgment signs should clearly indicate the type of highway services provided by the sponsor.

Standard

In addition to the general provisions for signs described in Chapter 2A and the sign design principles covered in the “Standard Highway Signs and Markings” book (see Section 1A.11), acknowledgment sign designs developed by State or local highway agencies shall comply with the following provisions:

- A. Neither the sign design nor the sponsor acknowledgment logo shall contain any contact information, directions, slogans (other than a brief jurisdiction wide program slogan, if used), telephone numbers, or Internet addresses, including domain names and uniform resource locators (URL);
- B. Except for the lettering, if any, on the sponsor acknowledgment logo, all of the lettering shall be in upper-case letters as provided in the “Standard Highway Signs and Markings” book (see Section 1A.11);

- C. In order to keep the main focus on the highway-related service and not on the sponsor acknowledgment logo, the area reserved for the sponsor acknowledgment logo shall not exceed 1/3 of the total area of the sign and shall be a maximum of 8 square feet, and shall not be located at the top of the sign;
- D. The entire sign display area shall not exceed 24 square feet;
- E. The sign shall not contain any messages, lights, symbols, or trademarks that resemble any official traffic control devices;
- F. The sign shall not contain any external or internal illumination, light-emitting diodes, luminous tubing, fiber optics, luminescent panels, or other flashing, moving, or animated features; and
- G. The sign shall not distract from official traffic control messages such as regulatory, warning, or guidance messages.

PART 2. SIGNS

Chapter 2M. Recreational and Cultural Interest Area Signs

TABLE OF CONTENTS

Chapter 2M. RECREATIONAL AND CULTURAL INTEREST AREA SERVICE SIGNS

2M.1	Scope	2M-1
2M.2	Application of Recreational and Cultural Interest Area Signs.....	2M-1
2M.3	Regulatory and Warning Signs	2M-1
2M.4	General Design Requirements for Recreational and Cultural Interest Area Symbol Signs ..	2M-1
2M.5	Symbol Sign Sizes	2M-3
2M.6	Use of Educational Plaques	2M-3
2M.7	Use of Prohibitive Circle and Diagonal Slash for Non-Road Applications	2M-4
2M.8	Placement of Recreational and Cultural Interest Area Symbol Signs	2M-4
2M.9	Destination Guide Signs	2M-4
2M.10	Memorial or Dedication Signing	2M-12
2M.10.1	Recreational or Cultural Interest Guide Signs and Symbol Signs on One Structure.	2M-13
2M.11	Resort Information Signs	2M-14

Mn Rev. 1
Mn Rev. 2
Mn Rev. 2
Mn Rev. 6

FIGURES

Figure 2M-1	Examples of Use of Arrows, Educational Plaques, and Prohibitory Slashes.....	2M-3
Figure 2M-2	Examples of Recreational and Cultural Interest Area Guide Signs	2M-5
Figure 2M-3	Arrangement, Height and Lateral Position of Signs Located Within Recreational Cultural Interest Areas	2M-6
Figure 2M-4	Examples of Symbol and Destination Guide Signing Layout	2M-7
Figure 2M-5	Recreational and Cultural Interest Area Symbol Signs for General Application.....	2M-8
Figure 2M-6	Recreational and Cultural Interest Area Symbol Signs for Accommodation.....	2M-9
Figure 2M-7	Recreational and Cultural Interest Area Symbol Signs for Services	2M-9
Figure 2M-8	Recreational and Cultural Interest Area Symbol Signs for Land Recreation	2M-10
Figure 2M-9	Recreational and Cultural Interest Area Symbol Signs for Water Recreation	2M-11
Figure 2M-10	Recreational and Cultural Interest Area Symbol Signs for Winter Recreation.....	2M-12
Figure 2M-11	Example of a Resort Information Sign Assembly.....	2M-15
Figure 2M-12	Symbol Signs Approved for Placement Below a Recreational or Cultural Interest Area Guide Sign.....	2M-16

Mn Rev. 2
Mn Rev. 2
Mn Rev. 7

TABLES

Table 2M-1	Category Chart for Recreational and Cultural Interest Area Symbols.....	2M-2
------------	---	------

Mn Rev. 1

Guidance

Position, height, and lateral clearance of Resort Information sign assemblies should be governed by Sections 2A and 2D of the MN MUTCD except as required above.

2M.11.7 Administration

Option

Counties may use county road and bridge funds for the purchase, fabrication, installation and maintenance of Resort Information signs along or adjacent to roads under their jurisdiction or town roads within the county at the expense of the requester.

Standard

The requester shall reimburse the county for 100 percent of the cost of the signs as per MN Statute 160.285, subd. 1.



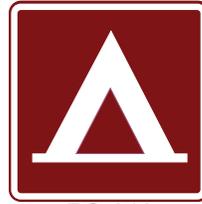
Figure 2M-11 Example of a Resort Information Sign Assembly



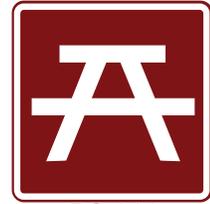
D7-X8a
Carry-in Access



RS-100
Information



RS-010
Campground



RS-044
Picnic Area



RS-081
Rock Climbing



RS-090
Bicycle Trail



RS-068
Hiking Trail



RS-064
Horse Trail



RS-128
Golf Course



RS-079
Canoeing



RS-054
Boat Ramp



RS-061
Swimming



RS-046
Cross Country Skiing



RS-052
Snowmobiling



RS-078
Snowshoeing

Min Rev. 7

Figure 2M-12 *Symbol Signs Approved for Placement Below a Recreational or Cultural Interest Area Guide Sign*

**PART 6. TEMPORARY TRAFFIC CONTROL
TABLE OF CONTENTS**

Chapter 6A. General

6A.1 General..... 6A-1

Chapter 6B. Fundamental Principles

6B.1 Fundamental Principles of Temporary Traffic Control 6B-1

Chapter 6C. Temporary Traffic Control Elements

6C.1 Temporary Traffic Control Plans 6C-1
 6C.2 Temporary Traffic Control Zones 6C-2
 6C.3 Components of Temporary Traffic Control Zones 6C-2
 6C.4 Advance Warning Area 6C-2
 6C.5 Transition Area..... 6C-4
 6C.6 Activity Area..... 6C-4
 6C.7 Termination Area 6C-8
 6C.8 Tapers..... 6C-8
 6C.9 Detours and Diversions..... 6C-10
 6C.10 One-Lane, Two-Way Traffic Control 6C-10
 6C.11 Flagger Method of One-Lane, Two-Way Traffic Control 6C-10
 6C.12 Flag Transfer Method of One-Lane, Two-Way Traffic Control 6C-10
 6C.13 Pilot Car Method of One-Lane, Two-Way Traffic Control 6C-10
 6C.14 Temporary Traffic Control Signal Method of One-Lane, Two-Way Traffic Control 6C-11
 6C.15 Stop or Yield Control Method of One-Lane, Two-Way Traffic Control 6C-11

Chapter 6D. Pedestrian and Worker Safety

6D.1 Pedestrian Considerations..... 6D-1
 6D.2 Accessibility Considerations 6D-3
 6D.3 Worker Considerations 6D-3

Chapter 6E. Flagger Control

6E.1 Qualifications for Flaggers 6E-1
 6E.2 High-Visibility Safety Apparel 6E-1
 6E.3 Hand-Signaling Devices 6E-1
 6E.4 Automated Flagger Assistance Devices..... 6E-2
 6E.5 STOP/SLOW Automated Flagger Assistance Devices..... 6E-5
 6E.6 Red/Yellow Lens Automated Flagger Assistance Devices 6E-6
 6E.7 Flagger Procedures 6E-7
 6E.8 Flagger Stations 6E-7
 6E.9 Flagger Method of One-Lane, Two-Way Traffic Control 6E-9
 6E.10 Flag Transfer Method of One-Lane, Two-Way Traffic Control 6E-9
 6E.11 Pilot Car Method of One-Lane, Two-Way Traffic Control 6E-9
 6E.12 Stop or Yield Control Method of One-Lane, Two-Way Traffic Control 6E-10
 6E.13 Flagging at Intersections..... 6E-10

Mn Rev. 7
Mn Rev. 7
Mn Rev. 7

Chapter 6F. Temporary Traffic Control Zone Devices

Mn Rev. 7	6F.1	Types of Devices.....	6F-1
	6F.2	General Characteristics of Signs.....	6F-1
	6F.3	Sign Placement	6F-2
	6F.4	Sign Maintenance	6F-7
	6F.5	Regulatory Sign Authority	6F-7
	6F.6	Regulatory Sign Design	6F-7
	6F.7	Regulatory Sign Applications	6F-9
	6F.8	ROAD (STREET) CLOSED Sign (R11-2)	6F-9
	6F.9	Local Traffic Only Signs (R11-3a, R11-4).....	6F-9
Mn Rev. 7	6F.10	Weight Limit Signs (R12-1a, R12-2, R12-5, R12-5 Supplements)	6F-10
	6F.11	STAY IN LANE Sign (R4-9).....	6F-10
	6F.12	Work Zone and Higher Fines Signs and Plaques.....	6F-10
	6F.13	PEDESTRIAN CROSSWALK Sign (R9-8).....	6F-11
	6F.14	SIDEWALK CLOSED Signs (R9-9, R9-10, R9-11, R9-11a)	6F-11
	6F.15	Special Regulatory Signs	6F-11
	6F.16	Warning Sign Function, Design, and Application	6F-11
	6F.16.1	Roll-Up Warning Signs.....	6F-12
	6F.17	Position of Advance Warning Signs	6F-12
	6F.18	ROAD (STREET) WORK AHEAD Sign (W20-1).....	6F-13
	6F.19	DETOUR AHEAD Sign (W20-2)	6F-13
	6F.20	ROAD (STREET) CLOSED AHEAD Sign (W20-3)	6F-13
	6F.20.1	TRAIL CLOSED AHEAD Sign (W20-3a).....	6F-13
	6F.21	ONE LANE ROAD AHEAD Sign (W20-4)	6F-13
	6F.22	Lane(s) Closed Signs (W21-X5, W20-X13).....	6F-14
	6F.23	CENTER LANE CLOSED Sign (W21-X5c)	6F-14
	6F.23.1	THRU TRAFFIC MERGE RIGHT (LEFT) Sign (W4-1a).....	6F-14
	6F.24	Lane Ends Sign (W4-2)	6F-14
	6F.24.1	MERGE Sign (W20-X3)	6F-14
	6F.25	ON RAMP Plaque (W13-4P).....	6F-14
Mn Rev. 7	6F.26	RAMP NARROWS Sign (W5-4).....	6F-15
	6F.27	SLOW TRAFFIC AHEAD Sign (W23-1).....	6F-15
	6F.28	EXIT OPEN, EXIT CLOSED Signs (E5-2, E5-2a)	6F-15
	6F.29	EXIT ONLY Sign (E5-3)	6F-15
	6F.30	NEW TRAFFIC PATTERN AHEAD, TRAFFIC CHANGE AHEAD Signs (W23-2, W3-X5).....	6F-15
	6F.31	Flagger Sign (W20-7)	6F-16
	6F.32	Two-Way Traffic Sign (W6-3)	6F-16
	6F.33	Workers Sign (W21-1).....	6F-16
	6F.34	FRESH OIL (TAR) Sign (W21-2)	6F-16
	6F.35	ROAD MACHINERY AHEAD Sign (W21-3)	6F-16
	6F.36	Motorized Traffic Signs (W8-6, W11-10).....	6F-17
	6F.37	SHOULDER WORK Signs (W21-5, W21-5a)	6F-17
	6F.38	SURVEY CREW Sign (W21-6a)	6F-17
	6F.38.1	CREW WORKING AHEAD Sign (W21-X6).....	6F-17
	6F.39	UTILITY WORK Sign (W21-7)	6F-18
	6F.40	Signs for Blasting Areas	6F-18

6F.41	BLASTING ZONE AHEAD Sign (W22-1)	6F-18
6F.42	TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2)	6F-18
6F.43	END BLASTING ZONE Sign (W22-3)	6F-18
6F.44	Shoulder Signs	6F-18
6F.44.1	SHOULDER DROP OFF Sign (W8-9a)	6F-19
6F.44.2	LOW SHOULDER Sign (W8-9), HIGH SHOULDER (W21-X9)	6F-19
6F.44.3	NO SHOULDER Sign (W8-23)	6F-19
6F.44.4	SOFT SHOULDER Sign (W8-4)	6F-19
6F.45	UNEVEN LANES Sign (W8-11)	6F-19
6F.46	STEEL PLATE AHEAD Sign (W8-24)	6F-19
6F.47	NO CENTER STRIPE Sign (W8-12a)	6F-20
6F.48	Reverse Curve Signs (W1-4 Series)	6F-20
6F.49	Double Reverse Curve Signs (W24-1, W24-1a, W24-1b)	6F-20
6F.50	Other Warning Signs	6F-20
6F.50.1	BUMP and DIP Signs (W8-1, W8-2)	6F-22
6F.50.2	BE PREPARED TO STOP Sign (W3-4)	6F-22
6F.51	Special Warning Signs	6F-22
6F.52	Advisory Speed Plaque (W13-1P)	6F-23
6F.53	Supplementary Distance Plaque (W7-3aP)	6F-23
6F.54	Motorcycle Plaque (W8-15P)	6F-23
6F.55	Guide Signs	6F-23
6F.56	ROAD WORK NEXT XX MILES Sign (G20-1)	6F-24
6F.56.1	Closure Notice Sign (G20-X1)	6F-24
6F.57	END ROAD WORK Sign (G20-2a)	6F-24
6F.58	PILOT CAR FOLLOW ME Sign (G20-4)	6F-24
6F.59	Detour Signs (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-9c, and M4-10)	6F-25
6F.60	Portable Changeable Message Signs	6F-25
6F.61	Arrow Boards	6F-28
6F.62	High-Level Warning Devices (Flag Trees)	6F-30
6F.63	Channelizing Devices	6F-31
6F.64	Cones	6F-34
6F.65	Tubular Markers	6F-35
6F.65.1	Surface Mounted Delineators	6F-35
6F.65.2	Weighted Channelizers	6F-36
6F.66	Vertical Panels	6F-36
6F.67	Drums	6F-36
6F.68	Type I, II, or III Barricades	6F-37
6F.69	Direction Indicator Barricades	6F-38
6F.70	Temporary Traffic Barriers as Channelizing Devices	6F-38
6F.71	Longitudinal Channelizing Barricades	6F-39
6F.72	Temporary Lane Separators	6F-39
6F.73	Other Channelizing Devices	6F-39
6F.74	Detectable Edging for Pedestrians	6F-39
6F.74.1	Temporary Walkway Surface	6F-40
6F.75	Temporary Raised Islands	6F-41
6F.76	Opposing Traffic Lane Divider and Sign (W6-4)	6F-41
6F.77	Pavement Markings	6F-41

6F.78	Interim Pavement Markings	6F-42
6F.79	Temporary Raised Pavement Markers	6F-42
6F.80	Post-Mounted Delineators	6F-45
6F.81	Lighting Devices	6F-45
6F.82	Floodlights	6F-45
6F.83	Warning Lights	6F-46
6F.83.1	Steady-Burn Electric Lamps	6F-47
6F.83.2	Roadway Lighting	6F-47
6F.84	Temporary Traffic Control Signals	6F-47
6F.85	Temporary Traffic Barriers	6F-48
6F.86	Crash Cushions	6F-50
6F.87	Rumble Strips	6F-53
6F.88	Screens	6F-53

Chapter 6G. Type of Temporary Traffic Control Zone Activity

6G.a	Introduction	6G-1
6G.1	Typical Applications	6G-1
6G.2	Work Duration	6G-2
6G.2.1	Long-Term Temporary Traffic Control	6G-2
6G.2.2	Intermediate-Term/Night Temporary Traffic Control Zone	6G-3
6G.2.3	Short-Term Temporary Traffic Control Zones	6G-3
6G.2.4	Short Duration Temporary Traffic Control Zones	6G-3
6G.2.5	Mobile Temporary Traffic Control Zones	6G-4
6G.3	Location of Work	6G-5
6G.4	Modifications to Fulfill Special Needs	6G-5
6G.5	Work Affecting Pedestrian and Bicycle Facilities	6G-6
6G.6	Work Outside of the Shoulder	6G-6
6G.7	Work on the Shoulder with No Encroachment	6G-7
6G.8	Work on the Shoulder with Minor Encroachment	6G-7
6G.9	Work Within the Median	6G-8
6G.9.1	Detours and Diversions	6G-8
6G.10	Work Within the Traveled Way of a Two-Lane Highway	6G-8
6G.10.1	Work Within the Traveled Way of a Rural Highway	6G-9
6G.11	Work Within the Traveled Way of an Urban Street	6G-9
6G.12	Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway	6G-10
6G.13	Work Within the Traveled Way at an Intersection	6G-11
6G.14	Work Within the Traveled Way of a Freeway or Expressway	6G-12
6G.15	Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway	6G-13
6G.16	Crossovers	6G-14
6G.17	Interchanges	6G-14
6G.18	Work in the Vicinity of a Grade Crossing	6G-14
6G.19	Temporary Traffic Control During Nighttime Hours	6G-14
6G.20	Installation, Maintenance and Inspection of Temporary Traffic Control	6G-15

Chapter 6H. Speed Limits in Temporary Traffic Control Zones

6H-1	General.....	6H-1
6H-2	Advisory Speeds	6H-1
6H-3	24/7 Construction Speed Limits	6H-4
6H-4	Workers Present Speed Limits	6H-6
6H-5	Speed Limit Fines in Work Zones	6H-11
6H-6	Guidelines for Speed Limits in Work Zones	6H-11

Chapter 6I. Control of Traffic Through Traffic Incident Management Areas

6I.1	General.....	6I-1
6I.2	Major Traffic Incidents	6I-2
6I.3	Intermediate Traffic Incidents.....	6I-3
6I.4	Minor Traffic Incidents	6I-3
6I.5	Use of Emergency-Vehicle Lighting	6I-3

Chapter 6J. Long Term Temporary Traffic Control Zone Layouts

6J-1	General.....	6J-i
------	--------------	------

Chapter 6K. Minnesota Temporary Traffic Control Field Manual

FIGURES

Figure 6C-1	Component Parts of a Temporary Traffic Control Zone	6C-3
Figure 6C-2	Types of Tapers and Buffer Spaces	6C-5
Figure 6C-3	Taper Length Criteria for Temporary Traffic Control Zones	6C-9
Figure 6D-1	Pedestrian Accessibility Checklist (Sheet 1 of 2)	6D-5
Figure 6D-1	Pedestrian Accessibility Checklist (Sheet 2 of 2)	6D-6
Figure 6E-1a	Example of the Use of a STOP/SLOW Automated Flagger Assistance Device (AFAD).....	6E-4
Figure 6E-3	Use of Hand-Signaling Devices by Flaggers	6E-8
Figure 6F-1	Height and Lateral Location of Signs - Typical Installations	6F-6
Figure 6F-2	Methods of Mounting Signs Other Than on Posts.....	6F-8
Figure 6F-4	Other Warning Signs That May be Found in Temporary Traffic Control Zones	6F-21
Figure 6F-6	Advance Warning Arrow Display Specifications.....	6F-29
Figure 6F-7	Channelizing Devices	6F-32
Figure 6F-10	Temporary Walkway Surface Dimensions.....	6F-40
Figure 6F-8a	Interim Pavement Markings - 3 Days or Less.....	6F-43
Figure 6F-8b	Interim Pavement Markings - 14 Days or Less.....	6F-44
Figure 6F-9	Portable Concrete Barrier Placement and End treatments (Sheet 1 of 2).....	6F-51
Figure 6F-9	Portable Concrete Barrier Placement and End treatments (Sheet 2 of 2)	6F-52
Figure 6J-1	Symbols Used in Typical Layouts.....	6J-iii
Figure 6J-2	Temporary Traffic Control Devices and Distance Charts	6J-iv

TABLES

Table 6C-1	Advance Warning Sign Placement.....	6C-2
Table 6C-2	Guidelines for the Length of a Longitudinal Buffer	6C-6
Table 6C-3	Taper Length Criteria for Temporary Traffic Control Zones	6C-7
Table 6E-1	Stopping Sight Distance as a Function of Speed	6E-9
Table 6F-1	Temporary Traffic Control Zone Sign and Plaque Sizes (Sheet 1 of 3).....	6F-3
Table 6F-1	Temporary Traffic Control Zone Sign and Plaque Sizes (Sheet 2 of 3).....	6F-4
Table 6F-1	Temporary Traffic Control Zone Sign and Plaque Sizes (Sheet 3 of 3).....	6F-5
Table 6F-2	Specifications for Portable Changeable Message Sign Use.....	6F-27
Table 6F-4	This table has been eliminated.....	6F-31
Table 6F-3	Recommended Spacing of Type A, B, and C Channelizing Devices.....	6F-34
Table 6F-5a	Drop-offs to Commonly Justify PCB Non-Construction Speed Limits of 45-55 mph.....	6F-49
Table 6F-5b	Drop-offs to Commonly Justify PCB Non-Construction Speed Limits of 60-70 mph.....	6F-49

LAYOUTS

Layout 6H-1	Advisory Speed Limit Multi-Lane Road	6H-2
Layout 6H-2	Dynamic Speed Display Sign	6H-3
Layout 6H-3	24/7 Construction Speed Limit	6H-5
Layout 6H-4	Workers Present Speed Limit.....	6H-8
Layout 6H-4a	Electronic Workers Present Speed Limit	6H-9
Layout 6H-4b	Workers Present Speed Limit Two-Lane, Two-Way Road with Flaggers.....	6H-10
Layout 6J-1	Typical Striping and Stripe Removal for Lane Closure, Multi-Lane Divided Road	6J-1
Layout 6J-2	Placement and Spacing of Temporary Raised Pavement Markers (TRPMs)	6J-2
Layout 6J-3	Typical Section for Two-Lane, Two-Way Operations, Multi-lane Divided Road	6J-3
Layout 6J-4	Typical Crossover to Two-Lane, Two-Way Operations, Multi-lane Divided Road.....	6J-4
Layout 6J-5	Typical Crossover from a Two-Lane, Two-Way Operation, Multi-Lane Divided Road.....	6J-5
Layout 6J-6	Two-Lane, Two-Way Operations at Ramps on an Open Roadway.....	6J-6
Layout 6J-7	Two-Lane, Two-Way Operation at an Exit Ramp Across a Closed Roadway	6J-7
Layout 6J-8	Two-Lane, Two-Way Operation at an Entrance Ramp Across a Closed Roadway	6J-8
Layout 6J-9	Mainline Right Lane Closed with an Exit Ramp Open	6J-9
Layout 6J-10	Mainline Right Lane Closed with an Entrance Ramp Open.....	6J-10
Layout 6J-11	Two-Lane, Two-Way Operation through a Typical Intersection.....	6J-11
Layout 6J-12	Lane Closure with Stop Signs on a Two-Lane, Two-Way Road.....	6J-12
Layout 6J-13	Lane Closure with Signals on a Two-Lane, Two-Way Road	6J-13
Layout 6J-14	Multiple Lane Shift on a Multi-Lane Divided Road.....	6J-14
Layout 6J-15	Road Closure at Interchange.....	6J-15
Layout 6J-16	Road Closure with Diversion (Bypass) on a Two-Lane, Two-Way Road.....	6J-16
Layout 6J-17	Road Closure with Detour.....	6J-17
Layout 6J-18	Detour for Closed Street	6J-18
Layout 6J-19	Detour for One Travel Direction.....	6J-19
Layout 6J-20	Typical Signage for a Road Closure	6J-20
Layout 6J-21	Entrance Ramp Closures.....	6J-21
Layout 6J-22	Typical Termini Signage.....	6J-22
Layout 6J-23	Typical Advance Signage	6J-23
Layout 6J-24a	Crosswalk Closures and Pedestrian Detours.....	6J-24a
Layout 6J-24b	Crosswalk Closures and Pedestrian Detours.....	6J-24b
Layout 6J-25a	Sidewalk Bypass	6J-25a
Layout 6J-25b	Sidewalk Bypass	6J-25b

PART 6. TEMPORARY TRAFFIC CONTROL

Chapter 6C. Temporary Traffic Control Elements

6C.1 Temporary Traffic Control Plans

Support

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

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

Guidance

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

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

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

Provisions for effective continuity of accessible circulation paths for pedestrians should be incorporated into the TTC process. Where existing pedestrian routes are blocked or detoured, information should be provided about alternative routes that are usable by pedestrians with disabilities, particularly those who have visual disabilities. Access to temporary bus stops, travel across intersections with accessible pedestrian signals (see Section 4E.6), and other routing issues should be considered where temporary pedestrian routes are channelized. Barriers and channelizing devices that are detectable by people with visual disabilities should be provided.

Option

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

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

Guidance

This alternate or modified plan should have the approval of the responsible highway agency prior to implementation.

Provisions for effective continuity of transit service should be incorporated into the TTC planning process because often public transit buses cannot efficiently be detoured in the same manner as other vehicles (particularly for short-term maintenance projects). Where applicable, the TTC plan should provide for features such as temporary bus stops, pull-outs, and satisfactory waiting areas for transit patrons, including persons with disabilities, if applicable (see Section 10A.5 for additional light rail transit issues to consider for TTC).

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

Reduced speed limits should be used only in the specific portion of the TTC zone where conditions or restrictive features are present. However, frequent changes in the speed limit should be avoided. A TTC plan should be designed so that vehicles can **safely** travel through the TTC zone with a speed limit reduction of no more than 15 mph.

A reduction of more than 15 mph in the speed limit should be used only when required by restrictive features in the TTC zone. Where restrictive features justify a speed reduction of more than 15 mph, additional driver notification should be provided. The speed limit should be stepped down in advance of the location requiring the lowest speed, and additional TTC warning devices should be used.

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

Support

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

6C.2 Temporary Traffic Control Zones

Support

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

A work zone is an area of a highway with construction, maintenance, or utility work activities. A work zone is typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to the END ROAD WORK sign or the last TTC device. TTC zones are established to provide safe traffic movement when the normal function of the roadway is suspended by scheduled activities, unscheduled activities or incidents.

An incident zone is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a traffic incident (see Section 6I.1). It extends from the first

warning device (such as a sign, light, or cone) to the last TTC device or to a point where road users return to the original lane alignment and are clear of the incident.

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

6C.3 Components of Temporary Traffic Control Zones

Support

Most TTC zones are divided into four areas: the advance warning area, the transition area, the activity area, and the termination area. C-1 illustrates these four areas. These four areas are described in Sections 6C.4 through 6C.7.

6C.4 Advance Warning Area

Support

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

Posted Speed Limit Prior to Work Starting (mph)	Distance Between Advance Warning Signs (mph)
0-30	100
35-40	325
45 - 50	600
55	750
60-65	1000
70-75	1200

Mn Rev. 7

Table 6C-1 Advance Warning Sign Placement

PART 6. TEMPORARY TRAFFIC CONTROL

Chapter 6D. Pedestrian and Worker Safety

6D.1 Pedestrian Considerations

Support

A wide range of pedestrians can be expected at work sites including the young, elderly, and people with disabilities such as hearing, visual, or mobility. These pedestrians need a clearly delineated and usable travel path. Considerations for pedestrians with disabilities are addressed in Section 6D.2.

Standard

The various temporary traffic control provisions for pedestrian and worker safety contained in Part 6 shall be applied, by knowledgeable (for example, trained and/or certified) persons after appropriate evaluation and engineering judgment.

Advance notification of sidewalk closures shall be provided by the maintaining agency.

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

Option

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

If an existing pedestrian route is impacted by a short-term or short-duration work zone that is attended with project personnel, establishing an alternate pedestrian route may not be necessary if the work can be stopped and pedestrians can navigate the work zone safely. Pedestrians may be delayed for a short period of time for project personnel to move equipment and material to facilitate passage. Work zone personnel may also provide assistance to the pedestrian as necessary.

Support

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

Guidance

The following three items should be considered when planning for pedestrians in TTC zones:

- A. Pedestrians should not be led into conflicts with vehicles, equipment, and operations.
- B. Pedestrians should not be led into conflicts with vehicles moving through or around the work site

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

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

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

Support

Layouts 6J-24 and 6J-25 as well as Layouts 88 and 89 in Chapter 6K show typical TTC device usage and techniques for pedestrian movement through work zones.

Guidance

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

- A. Provisions for continuity of accessible paths for pedestrians should be incorporated into the TTC plan.
- B. Access to transit stops should be maintained.
- C. A smooth, continuous hard surface should be provided throughout the entire length of the temporary pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be a barrier to wheelchair use. The geometry and alignment of the facility should meet the applicable requirements of the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11). A temporary walkway surface should be provided to cover short segments of rough, soft or uneven ground or hazards. This temporary walkway surface should comply with the provisions of 6F.74.1.
- D. The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary

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

- E. Blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing devices such as audible information devices, accessible pedestrian signals, or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a long cane or who have low vision. Where pedestrian traffic is detoured to a TTC signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals should be considered for crossings along an alternate route.
- F. When channelization is used to delineate a pedestrian pathway, a continuous detectable edging should be provided throughout the length of the facility such that pedestrians using a long cane can follow it. These detectable edgings should comply with the provisions of Section 6F.74. If a pedestrian pathway enters an area where vehicular traffic is likely to traverse (such as work area access), a temporary walkway surface should be provided that is firm, stable and slip resistant. This temporary walkway surface should comply with the provisions of 6F.74.1.
- G. Signs and other devices mounted lower than 7 feet above the temporary pedestrian pathway should not project more than 4 inches into accessible pedestrian facilities.

Option

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

Guidance

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

Ballast for TTC devices should be kept to the minimum amount needed and should be mounted low to prevent penetration of the vehicle windshield.

Movement by work vehicles and equipment across designated pedestrian paths should be minimized and, when necessary, should be controlled by flaggers or TTC. Staging or stopping of work vehicles or equipment along the side of pedestrian paths should be avoided, since it encourages

movement of workers, equipment, and materials across the pedestrian path.

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

Option

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

Guidance

Covered walkways should be sturdily constructed and adequately lighted for nighttime use.

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

If a temporary traffic barrier is used to shield pedestrians, it should be designed to accommodate site conditions.

Support

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

Standard

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

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

Option

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

Support

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

Guidance

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

Support

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

Guidance

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

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

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

6D.2 Accessibility Considerations

Support

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

Guidance

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

Standard

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

Support

Maintaining a detectable, channelized pedestrian route is much more useful to pedestrians who have visual disabilities

than closing a walkway and providing audible directions to an alternate route involving additional crossings and a return to the original route. Braille is not useful in conveying such information because it is difficult to find. Audible instructions might be provided, but the extra distance and additional street crossings might add complexity to a trip.

Guidance

Because printed signs and surface delineation are not usable by pedestrians with visual disabilities, blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing audible information devices, accessible pedestrian signals, and barriers and channelizing devices that are detectable to pedestrians traveling with the aid of a long cane or who have low vision.

Support

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

Guidance

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

Option

The Pedestrian Accessibility Checklist (see Figure 6D-1) may be used by the project designer during the TTC design stage of a project to assure that all considerations have been made to accommodate the needs of pedestrians, including those with disabilities.

6D.3 Worker Considerations

Support

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

Maintaining TTC zones with road user flow inhibited as

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

Guidance

The following are the key elements of worker safety and TTC management that should be considered to improve worker safety:

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

Standard

All workers, including emergency responders, within the right-of-way who are exposed either to traffic (vehicles using the highway for purposes of travel) or to work vehicles and construction equipment within the TTC zone shall wear high-visibility safety apparel that meets the Performance Class 2

or 3 requirements of the ANSI/ISEA 107-2004 publication entitled "American National Standard for High-Visibility Safety Apparel and Headwear" (see Section 1A.11), or equivalent revisions, and labeled as meeting the ANSI 107-2004 standard performance for Class 2 or 3 risk exposure, except as provided in the following Option. A person designated by the employer to be responsible for worker safety shall make the selection of the appropriate class of garment.

Option

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

Guidance

When working in an area that does not require the use of a hard hat for head protection, a high visibility hat in the above colors should be worn.

Standard

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

Except as provided in the following the following Option, firefighters or other emergency responders working within the right-of-way shall wear high-visibility safety apparel as described in this Section.

Option

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

The following are additional elements of TTC management that may be considered to improve worker safety:

- A. Shadow Vehicle - in the case of mobile and constantly moving operations, such as pothole patching and striping operations, a shadow vehicle, equipped with appropriate lights and warning signs may be used to protect the workers from impacts by errant vehicles.

PART 6. TEMPORARY TRAFFIC CONTROL

Chapter 6E. Flagger Control

6E.1 Qualifications for Flaggers

Support

Minnesota Statute 169.06, subd. 4(e), allows a flagger to stop and hold traffic as necessary to ensure the safety of highway workers and the motoring public.

Minnesota Statute 169.06, subd. 4(a) requires the driver of any vehicle to obey the instructions of any official traffic-control device placed in accordance with the provisions of Chapter 169, unless otherwise directed by a traffic or police officer. (Rev. 7, 2019)

Guidance

Because flaggers are responsible for public safety and make the greatest number of contacts with the public of all highway workers, they should be trained in safe traffic control practices and public contact techniques. Flaggers should be able to satisfactorily demonstrate the following abilities:

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

6E.2 High-Visibility Safety Apparel

Standard

High visibility apparel shall comply with current Minnesota OSHA Rules 5207.0100 and 5207.1000 and your agency's policies.

Flaggers shall wear high-visibility clothing meeting ANSI/ISEA 107-2004 (or ANSI/ISEA 107-2010) Performance Class 3 requirements. ANSI/ISEA 107-2015 Type R, Performance Class 3 is also acceptable. The Class 3 requirements shall be met by wearing a Class 2 or Class 3 vest, shirt, or jacket; as well as Class E pants. Clothing shall have an attached original label indicating the Performance Class.

- Clothing background color shall be fluorescent orange-red, fluorescent yellow-green, or a combination of the two.
- Retroreflective material on the clothing shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors. The material shall be visible at a minimum distance of 1000 feet.
- The vest, shirt, or jacket shall be worn such that 360 degree visibility in a horizontal plane of the clothing is maintained.
- A neat appearance and clean clothing shall be maintained in order to help command respect of the drivers.

Guidance

A retroreflective hat in the above colors should be worn.

Option

A retroreflective wrist band in the above colors may be used. The wrist band helps differentiate the flagger from work zone devices.

6E.3 Hand-Signaling Devices

Guidance

The STOP/SLOW paddle should be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags. Use of flags should be limited to emergency situations.

Standard

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

Guidance

The STOP/SLOW paddle should be fabricated from light semi-rigid material.

Support

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

Option

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

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

Standard

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

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

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

Flags, when used, shall be red or fluorescent orange/red in color, shall be a minimum of 24 inches square, and shall be securely fastened to a staff that is approximately 36 inches in length.

Guidance

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

Standard

When used at nighttime, flags shall be retroreflectorized red or fluorescent orange-red.

Option

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

Standard

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

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

6E.4 Automated Flagger Assistance Devices

Support

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

There are two types of AFADs:

- A. An AFAD (see Section 6E.5) that uses a remotely controlled STOP/SLOW sign on either a trailer or a movable cart system to alternately control right-of-way.
- B. An AFAD (see Section 6E.6) that uses remotely controlled red and yellow lenses and a gate arm to alternately control right-of-way.

AFADs might be appropriate for short-term and intermediate-term activities (see Section 6G.2). Typical applications include TTC activities such as, but not limited to:

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

Standard

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

When used at night, the AFAD location shall be illuminated in accordance with Section 6E.8.

Guidance

AFADs should not be used for long-term stationary work (see Section 6G.2).

Standard

Because AFADs are not traffic control signals, they shall not be used as a substitute for or a replacement for a continuously operating temporary traffic control signal as described in Section 6F.84.

AFADs shall meet the crashworthy performance criteria contained in Section 6F.1.

Guidance

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

Standard

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

If used, an AFAD shall be operated only by a flagger (see Section 6E.1) who has been trained on the operation of the AFAD. The flagger(s) operating the AFAD(s) shall not leave the AFAD(s) unattended at any time while the AFAD(s) is being used.

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

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

Except as provided in the following option, two flaggers shall be used when using either Method 1 or Method 2.

Option

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

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

Guidance

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

Standard

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

Guidance

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

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

NOTES:

1. The approach sight distance to the Automated Flagging Assistance Device (AFAD) shall be at least the Decision Sight Distance (**D**).
- ② The ONE LANE ROAD AHEAD sign may be omitted when the posted speed limit is 40 mph or less.
- ③ The two-way taper should be 50 feet in length using 5 equally spaced channelizing devices.

- ④ When using a single operator, they shall be located so they can see traffic at both AFAD locations.
- ⑤ Use the appropriate sign on the AFAD.

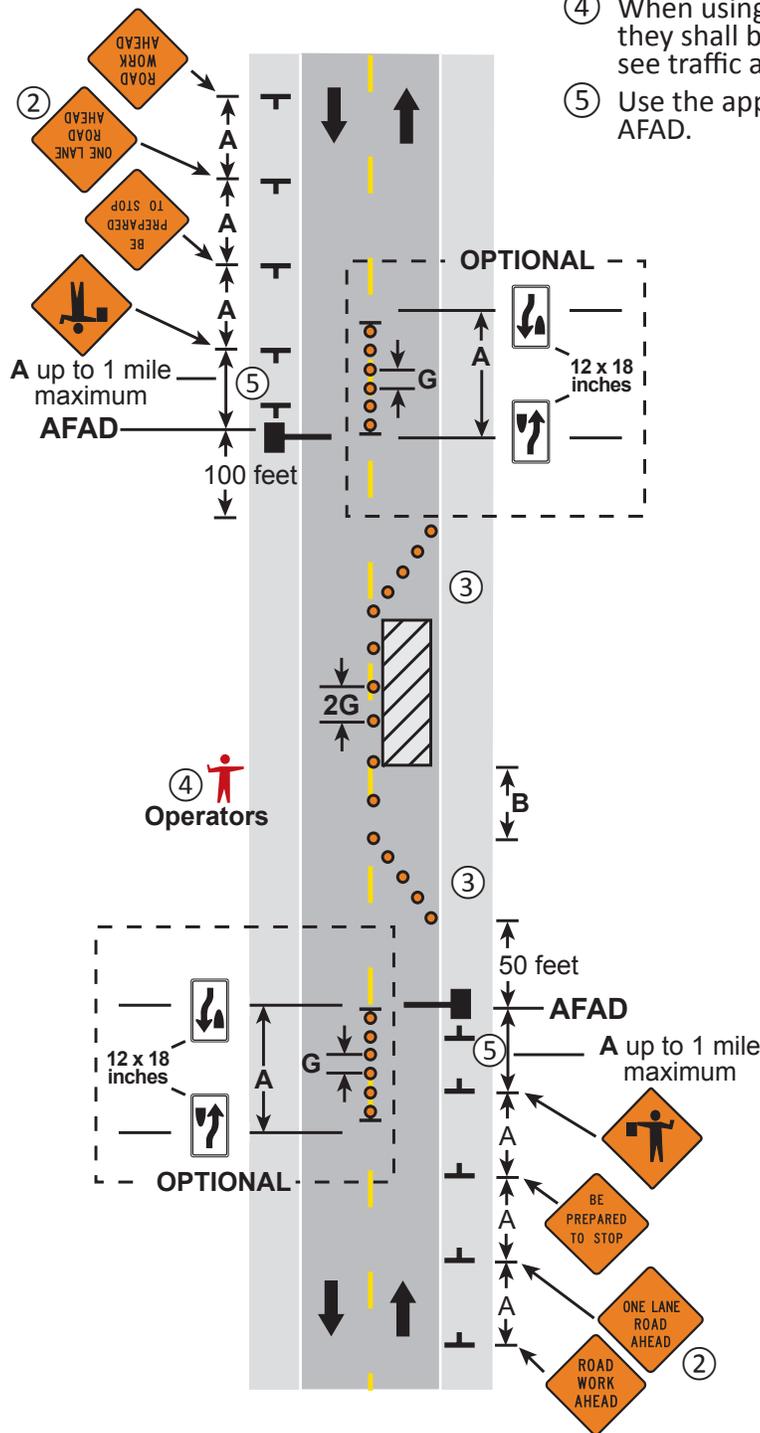


Figure 6E-1a Example of the Use of a STOP/SLOW Automated Flagging Assistance Device (AFAD)

6E.7 Flagger Procedures

Support

The use of paddles and flags by flaggers are illustrated in Figure 6E-3.

Standard

Flaggers shall use a STOP/SLOW paddle, a flag, or an Automated Flagger Assistance Device (AFAD) to control road users approaching a TTC zone. The use of hand movements alone without a paddle, flag, or AFAD to control road users shall be prohibited except for law enforcement personnel or emergency responders at incident scenes as described in Section 6I.1.

The following methods of signaling with paddles shall be used:

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

Option

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

Standard

In emergency situations a minimum size 24 x 24 inch red flag may be used in lieu of a paddle until a paddle is available, however, as soon as a paddle is available it shall be used.

The following methods of signaling with a flag shall be used:

- A. To stop road users, the flagger shall face road users and extend the flag staff horizontally across the road users' lane in a stationary position so that the full area of the flag is visibly hanging below the staff. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.
- B. To direct stopped road users to proceed, the flagger shall face road users with the flag and arm lowered

from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.

- C. To alert or slow traffic, the flagger shall face road users and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down without raising the arm above a horizontal position. The flagger shall keep the free hand down.

Guidance

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

Option

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

Guidance

When a single flagger is used, the flagger should be stationed in the closed lane at the beginning of the taper or in a position where good visibility and traffic control can be maintained at all times.

6E.8 Flagger Stations

Standard

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

Option

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

Guidance

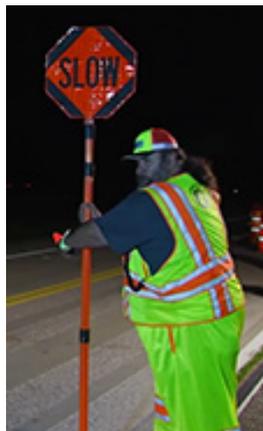
Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space. The flagger should identify an escape route that can be used to avoid being struck by an errant vehicle.

The Use of Hand Signaling Devices by a Flagger

To Stop Traffic



To Release Traffic



To Alert and Slow Traffic



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

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet
* Posted speed, off-peak 85th- percentile speed prior to work starting, or the anticipated operating speed	

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

Standard

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

6E.9 Flagger Method of One-Lane, Two-Way Traffic Control

Option

On an intermediate volume road (less than 1500 ADT) with good visibility, a single flagger may be used to control one direction of traffic while the other direction flows free. In this situation, the flagger is positioned in the closed lane at the beginning of the taper. The flagger stops the traffic approaching in the closed lane. When the open lane is clear, the flagger allows traffic to proceed.

A single flagger may also be used to stop traffic in a lane while that lane is closed. An example would be a truck depositing material off the edge of the roadway. In this situation, the flagger would stop the traffic in this lane while the other lane flows free. When the lane is open again, the flagger allows the traffic to proceed in their normal lane. After stopped traffic is allowed to proceed, the flagger should turn the flagger paddle parallel to traffic so that no message is displayed to either direction of traffic.

Standard

If the Decision Sight Distance is not available beyond the work space for a single flagger to detect oncoming traffic, two flaggers shall be used.

Guidance

When good visibility and traffic control cannot be maintained by one flagger station, traffic should be controlled by a flagger at each end of the section. One of the flaggers should be designated as the coordinator. Flaggers should be able to communicate with each other orally, electronically, or with manual signals. These manual signals should not be mistaken for flagging signals.

6E.10 Flag Transfer Method of One-Lane, Two-Way Traffic Control

Guidance

The flag transfer method should be employed only where the one-way traffic is confined to a relatively short length of a road, usually not more than 1 mile in length.

6E.11 Pilot Car Method of One-Lane, Two-Way Traffic Control

Guidance

The operation of the pilot vehicle should be coordinated with flagging operations or other controls at each end of the one-lane section. The pilot car should have the name of the contractor or contracting authority prominently displayed.

Standard

The PILOT CAR FOLLOW ME (G20-4) sign shall be mounted at a conspicuous location on the rear of the vehicle.

TTC devices, such as channelizing devices shall be utilized in all transition areas and parallel or longitudinally to buffer spaces wherever lane shifts occur. See Chapter 6K, Layout 18 titled "Lane Closure, Pilot Car Method; Two-Lane, Two-Way Road."

Guidance

Additional channelizing devices should be placed in areas that may be considered hazardous to the public or workers.

These areas include but are not limited to:

- A. Full longitudinal channelizing, as stated in Section 6F.58 (Channelizing Devices), when traffic is adjacent to longitudinal drop-offs greater than 4 inches.
- B. Full longitudinal channelizing, as stated in Section 6F.58 (Channelizing Devices), and barriers, as stated in Section 6F.81 (Temporary Traffic Barriers), when traffic is adjacent to longitudinal drop-offs greater than 12 inches.
- C. Full longitudinal channelizing, as stated in Section 6F.58 (Channelizing Devices), when roadway geometry, dust, weather, or darkness restricts visibility of the open travel lane.

Flagging and pilot car procedures should ensure that traffic platoons remain tightly spaced to prevent unsafe speed variations and deviations from the desired traffic lane. Flaggers should only allow platooned vehicles to proceed behind the pilot car. Vehicles arriving late to the flagging station should not be allowed to proceed if the last vehicle has traveled more than 300 feet beyond the flagger station.

Pilot cars should lead traffic through the work zone at a safe speed, typically 10 mph below the posted speed limit. Their speed should be further reduced when:

- the vehicles in the platoon begin to separate,
- there are poor roadway surface conditions (such as gravel or bumps),
- there is an adjacent lane or shoulder drop-off,
- weather conditions or visibility are poor,
- passing work crews or equipment,
- passing another platoon of vehicles,
- maneuvering through transition areas, or
- other similar restrictions.

6E.12 Stop or Yield Control Method of One-Lane, Two-Way Traffic Control

Guidance

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

6E.13 Flagging at Intersections

Standard

Only a licensed uniformed law enforcement officer has the authority to override a fully operating traffic control signal system (operating through the green, yellow, red cycle). Approval from the road authority shall be acquired prior to placing signals into red flash mode or turning signals off.

Option

When traffic signals are set to flash red for all approaches, or turned off and temporary STOP signs are installed, the intersection may be treated as a non-signalized intersection. A flagging operation within a non-signalized intersection may override STOP and YIELD signs in the intersection.

High-volume intersections, large intersections, roundabouts, or complicated situations may require additional flaggers.

Guidance

When flagging within an intersection, consider the following:

- The flagger(s) should use hand signals with a flag or flashlight with red glow cone to control traffic movements rather than the typical STOP/SLOW paddle.
- The flagger(s) should be aware of traffic conditions at adjacent intersections and coordinate operations to minimize traffic backups and conflicts.

Standard

When multiple flaggers are used, a lead flagger shall be designated to coordinate flagging operations.

Option

The flagger(s) may direct vehicles to proceed through a STOP sign controlled condition while holding traffic on other approaches. Although the flagger may urge motorists to continue through the STOP sign, the flagger has no authority to prevent traffic from stopping and must allow for stopping within the operation.

PART 6. TEMPORARY TRAFFIC CONTROL

Chapter 6F. Temporary Traffic Control Zone Devices

6F.1 Types of Devices

Guidance

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

Support

FHWA policy requires that all roadside appurtenances such as traffic barriers, barrier terminals and crash cushions, bridge railings, sign and light pole supports, and work zone hardware used on the National Highway System meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350, “Recommended Procedures for the Safety Performance Evaluation of Highway Features” or the American Association of State Highway and Transportation Officials (AASHTO) “Manual for Assessing Safety Hardware (MASH).” The FHWA website at “https://safety.fhwa.dot.gov/roadway_dept/countermeasures/reduce_crash_severity/policy_memo_guidance.cfm” identifies all such hardware and includes copies of FHWA acceptance letters for each of them. In the case of proprietary items, links are provided to manufacturers’ websites as a source of detailed information on specific devices. The website also contains an “Ask the Experts” section where questions on roadside design issues can be addressed.

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

Crashworthiness and crash testing information on devices described in Part 6 are found in AASHTO’s “Roadside Design Guide” (see Section 1A.11).

As defined in Section 1A.13, “crashworthy” is a characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the NCHRP Report 350, “Recommended Procedures for the Safety Performance Evaluation of Highway Features” or the American Association of State Highway and Transportation Officials (AASHTO) “Manual for Assessing Safety Hardware (MASH).”

Standard

Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide

road users, placed on, over, or adjacent to a street, highway, private roads open to public travel (see definition in Section 1A.13), pedestrian facility, or bikeway by authority of a public body or official having jurisdiction.

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

All signs, barricades, drums, weighted channelizers, and vertical panels shall be retroreflectorized. Cones and tubes shall be retroreflectorized if used at night.

Devices that are excessively worn, bent, damaged or have lost a significant amount of their retroreflectivity shall be promptly removed (see Chapter 6K, Quality Standards on pages 6K-94 through 6K-108).

Guidance

Particular attention should be given to assuring that all traffic control devices are maintained and kept clean, visible, and properly positioned at all times.

6F.2 General Characteristics of Signs

Support

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

Standard

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

Option

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

Support

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

Option

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

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

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

Standard

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

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

Option

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

Standard

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

Support

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

Section 2A.6 contains additional information regarding the design of signs, including an Option allowing the development of special word message signs if a standard word message or symbol sign is not available to convey the necessary regulatory, warning, or guidance information.

Standard

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

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

Option

Sign illumination may be either internal or external.

Signs may be made of rigid or flexible material.

Standard

Mesh nonretroreflective signs shall not be used.

6F.3 Sign Placement**Guidance**

Signs should be located on the right-hand side of the roadway unless otherwise provided in this Manual.

Option

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

Support

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

Standard

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

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

The minimum height, measured vertically from the bottom of the sign to the sidewalk, of signs installed above sidewalks shall be 7 feet.

Option

The height to the bottom of a secondary sign mounted below another sign may be 1 foot less than the height provided in the previous Standard.

Guidance

Neither portable nor permanent sign supports should be located on sidewalks, bicycle facilities, or areas designated for pedestrian or bicycle traffic. If the bottom of a secondary sign that is mounted below another sign is mounted lower than 7 feet above a pedestrian sidewalk or pathway (see Section 6D.2), the secondary sign should not project more than 4 inches into the pedestrian facility.

Standard

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

Signs mounted on barricades, barricade/sign combinations shall be crashworthy.

Guidance

Except as provided in the following Option, signs anticipated to be in one place for more than 30 days should not be mounted on portable supports. Whenever this anticipated time period changes, signs mounted on portable supports should be re-evaluated.

Option

Signs, whose location on a paved surfaces is necessary, may be mounted on portable supports for more than 30 days.

Support

Methods of mounting signs other than on posts are illustrated in Figure 6F-2.

Guidance

Signs mounted on Type III barricades should not cover more than 50 percent of the top two rails or 33 percent of the total area of the three rails.

Standard

All sign supports shall be crashworthy.

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

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

In addition, regulatory signs installed on barricades or other portable supports shall be installed so that the center of the sign or sign assembly is at least 4 ft above the traveled way.

Option

For mobile operations, a sign may be mounted on a work vehicle, a shadow vehicle, or a trailer stationed in advance of the TTC zone or moving along with it. The work vehicle, the shadow vehicle, or the trailer may or may not have an impact attenuator.

Support

If alterations are made to specific traffic control device supports that have been successfully crash tested in accordance with NCHRP Report 350, or the American Association of State Highway and Transportation Officials (AASHTO) “Manual for Assessing Safety Hardware (MASH)”, the altered supports might not be considered to be crashworthy.

6F.4 Sign Maintenance

Guidance

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

Standard

Signs that have lost significant legibility shall be promptly replaced as soon as possible after notification.

Support

Section 2A.8 contains information regarding the retroreflectivity of signs, including the signs that are used in TTC zones.

6F.5 Regulatory Sign Authority

Support

Regulatory signs inform road users of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.

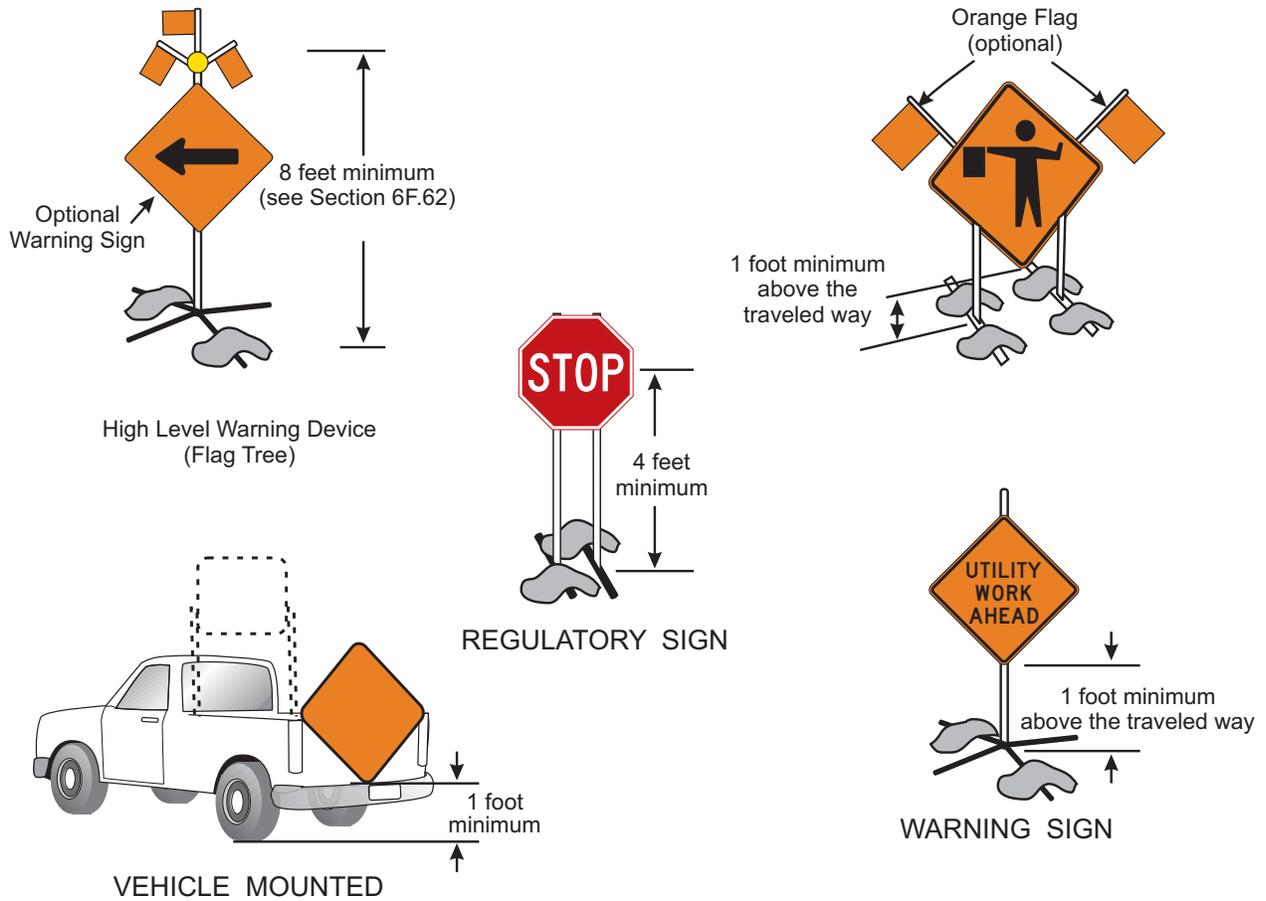
Standard

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

6F.6 Regulatory Sign Design

Standard

TTC regulatory signs shall comply with the Standards for regulatory signs presented in Part 2 and in the MnDOT Standard Signs and Markings Manual and the FHWA “Standard Highway Signs and Markings” book (see Section 1A.11).



PORTABLE AND TEMPORARY MOUNTINGS

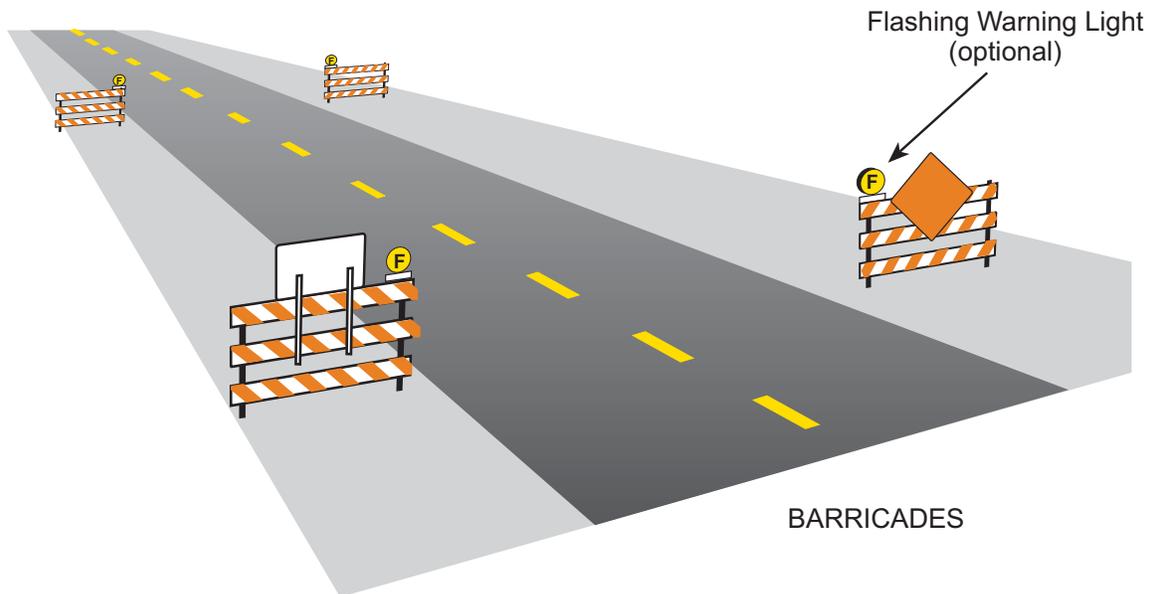


Figure 6F-2 Methods of Mounting Signs Other Than on Posts

6F.36 Motorized Traffic Signs (W8-6, W11-10)



W8-6



W11-10

Option

Motorized Traffic (W8-6, W11-10) signs may be used to alert road users to locations where unexpected travel on the roadway or entries into or departures from the roadway by construction vehicles might occur. The TRUCK CROSSING (W8-6) word message sign may be used as an alternate to the Truck Crossing symbol (W11-10) sign where there is an established construction vehicle crossing of the roadway.

Support

These locations might be relatively confined or might occur randomly over a segment of roadway.

6F.37 SHOULDER WORK Signs (W21-5, W21-5a)



W21-5



W21-5a

Support

Shoulder Work signs warn of maintenance, reconstruction, or utility operations on the highway shoulder where the roadway is unobstructed.

Standard

The Shoulder Work sign shall have the legend SHOULDER WORK (W21-5), RIGHT (LEFT) SHOULDER CLOSED (W21-5a), or RIGHT (LEFT) SHOULDER CLOSED XXX FT or AHEAD (W21-5b).

Option

The Shoulder Work sign may be used in advance of the point on a non-limited access highway where there is shoulder work. It may be used singly or in combination with a ROAD WORK NEXT XX MILES or ROAD WORK AHEAD sign.

Guidance

On freeways and expressways, the RIGHT (LEFT) SHOULDER CLOSED XX FT or AHEAD (W21-5b) sign followed by RIGHT (LEFT) SHOULDER CLOSED (W21-5a) sign should be used in advance of the point where the shoulder work occurs and should be preceded by a ROAD WORK AHEAD sign.

6F.38 SURVEY CREW Sign (W21-6a)

Guidance

The SURVEY CREW (W21-6a) sign should be used to warn of surveying crews working in or adjacent to the roadway.



W21-6a



W21-X6

6F.38.1 CREW WORKING AHEAD Sign (W21-X6)

Guidance

The CREW WORKING AHEAD (W21-X6) sign should be used for short duration activities being done on or off the roadway for such thing as filming, surveying, tree trimming, road inspection, lighting, signal work, utility work, and other activities where a crew is visible to traffic.

Option

The CREW WORKING AHEAD (W21-X6) sign may be used in place of the SURVEY CREW (W21-6) sign or the SURVEY CREW AHEAD (W21-6a) sign.

6F.39 UTILITY WORK Sign (W21-7)



W21-7

Option

The UTILITY WORK (W21-7) sign may be used as an alternate to the ROAD (STREET) WORK (W20-1) sign for utility operations on or adjacent to a highway.

Support

Typical examples of where the UTILITY WORK sign could be used in place of the ROAD WORK AHEAD sign appear in Chapter 6K (*the Field Manual*), Layouts 6K-3, 6K-8, 6K-15, 6K-16, 6K-28, 6K-45.

Standard

The UTILITY WORK sign shall carry the legend UTILITY WORK, XX FEET, XX MILES, or AHEAD.

6F.40 Signs for Blasting Areas

Support

Radio-Frequency (RF) energy can cause the premature firing of electric detonators (blasting caps) used in TTC zones.

Standard

Road users shall be warned to turn off mobile radio transmitters and cellular telephones where blasting operations occur. A sequence of signs shall be prominently displayed to direct operators of mobile radio equipment, including cellular telephones, to turn off transmitters in a blasting area. These signs shall be covered or removed when there are no explosives in the area or the area is otherwise secured.

6F.41 BLASTING ZONE AHEAD Sign (W22-1)



W22-1

Standard

The BLASTING ZONE AHEAD (W22-1) sign shall be used in advance of any TTC zone where explosives are being used. The TURN OFF 2-WAY RADIO AND CELL PHONE and END BLASTING ZONE signs shall be used in sequence with this sign.

6F.42 TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2)

Standard

The TURN OFF 2-WAY RADIO AND CELLULAR PHONE (W22-2) sign shall follow the BLASTING ZONE AHEAD sign and shall be placed at least 1,000 feet before the beginning of the blasting zone.



W22-2



W22-3

6F.43 END BLASTING ZONE Sign (W22-3)

Standard

The END BLASTING ZONE (W22-3) sign shall be placed a minimum of 1,000 feet past the blasting zone.

Option

The END BLASTING ZONE sign may be placed either with or preceding the END ROAD WORK sign.

6F.44 Shoulder Signs

Support

The signs in the following sections are to be used as described.

Mn Rev. 7

Mn Rev. 1

Mn Rev. 1

6F.44.1 SHOULDER DROP OFF Sign (W8-9a)



W8-9a

Standard

The SHOULDER DROP-OFF (W8-9a) sign shall be used when a shoulder drop-off, adjacent to the travel lane, exceeds 2 inches in depth and is not protected by portable barriers and the LOW SHOULDER sign (W8-9) is not used.

6F.44.2 LOW SHOULDER Sign (W8-9), HIGH SHOULDER (W21-X9)



W8-9



W21-X9

Standard

The LOW SHOULDER sign (W8-9) and the HIGH SHOULDER sign (W21-X9) shall be used for a shoulder drop-off or rise in accordance with the guidelines shown in Figure 6K-7 on page 6K-aj.

6F.44.3 NO SHOULDER Sign (W8-23)



W8-23

Standard

The NO SHOULDER sign (W8-23) shall be used for a shoulder drop-off in accordance with the guidelines shown in Figure 6K-7 on page 6K-aj through 6K-al.

6F.44.4 SOFT SHOULDER Sign (W8-4)

Option

The SOFT SHOULDER sign (W8-4) may be used for a shoulder drop-off between 2 and 4 inches in height and the edge has been tapered and compacted at a rate of 6:1 so that a vehicle may safely drive on it.



W8-4



W8-11

6F.45 UNEVEN LANES Sign (W8-11)

Standard

The UNEVEN LANES (W8-11) sign shall be used in accordance with the guidelines shown in Figure 6-3 on page xxi.

Guidance

The UNEVEN LANES (W8-11) sign should be used during operations that create a difference in elevation between adjacent lanes that are open to travel.

6F.46 STEEL PLATE AHEAD Sign (W8-24)



W8-24

Option

A STEEL PLATE AHEAD (W8-24) sign may be used to warn road users that the presence of a temporary steel plate(s) might make the road surface uneven and might create slippery conditions during wet weather.

Mn Rev. 7
Mn Rev. 5
Mn Rev. 3

Mn Rev. 7
Mn Rev. 5
Mn Rev. 3

6F.47 NO CENTER STRIPE Sign (W8-12a)



W8-12a

Standard

The NO CENTER STRIPE (W8-12a) sign shall be used as detailed in Section 6F.78.

Guidance

This sign should also be used at major connection, traffic generators, and/or at appropriate intervals to advise motorists entering the zone.

6F.48 Reverse Curve Signs (W1-4 Series)



W1-4



W1-4b



W1-4c

Guidance

In order to give road users advance notice of a lane shift, a Reverse Curve (W1-4, W1-4b, or W1-4c) sign should be used when a lane (or lanes) is being shifted to the left or right. If the design speed of the curves is 30 mph or less, a Reverse Turn (W1-3) sign should be used.

Standard

If a Reverse Curve (or Turn) sign is used, the direction of the reverse curve (or turn) symbol shall be consistent with the desired vehicle path. Except as provided in the following Option, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users.

Option

Where two or more lanes are being shifted, a W1-4 (or W1-3) sign with an ALL LANES (W24-1cP) plaque may be used instead of a sign that illustrates the number of lanes.

Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.

6F.49 Double Reverse Curve Signs (W24-1, W24-1a, W24-1b)



W24-1



W24-1a



W24-1b

Option

The Double Reverse Curve (W24-1, W24-1a, or W24-1b) sign may be used where the tangent distance between two reverse curves is less than 600 feet, thus making it difficult for a second Reverse Curve (W1-4 series) sign to be placed between the curves. If the design speed of the curves is 30 mph or less, Double Reverse Turn signs should be used.

Standard

If a Double Reverse Curve (or Turn) sign is used, the direction of the double reverse curve (or turn) symbol shall be consistent with the desired vehicle path. Except as provided in the first paragraph of the following Option, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users.

Option

Where two or more lanes are being shifted, a W24-1 (or Double Reverse Turn sign showing one lane) sign with an ALL LANES (W24-1cP) plaque may be used instead of a sign that illustrates the number of lanes.

Where more than three lanes are being shifted, the Double Reverse Curve (or Turn) sign may be rectangular.

6F.50 Other Warning Signs

Option

Advance warning signs may be used by themselves or with other advance warning signs.

Besides the warning signs specifically related to TTC zones, several other warning signs in Part 2 may apply in TTC zones.

Standard

Except as provided in Section 6F.2, other warning signs that are used in TTC zones shall have black legends and borders on an orange background.

Mn Rev. 1

Mn Rev. 3

Mn Rev. 4

Mn Rev. 3

Standard

Techniques of message display such as animation, rapid flashing, dissolving, exploding, scrolling, traveling horizontally or vertically across the face of the sign, or other dynamic elements shall not be used.

Guidance

When a message is divided into two phases, the display time for each phase should be at least 2 seconds, and the sum of the display times for both of the phases should be a maximum of 8 seconds.

Messages should be designed taking into account the following factors:

- A. Each phase should convey a single thought.
- B. If the message can be displayed in one phase, the top line should present the problem, the center line should present the location or distance ahead, and the bottom line should present the recommended driver action.
- C. The message should be as brief as possible.
- D. The entire display should be readable twice at the posted speed limit prior to work starting.
- E. Any delay message should accurately reflect the traffic delay time.

- F. When a message is longer than two phases, additional Portable Changeable Message signs should be used. When multiple portable changeable message signs are needed, they should be placed on the same side of the roadway and they should be separated from each other by a distance of at least 1,000 feet on freeways and expressways, and by a distance of at least 500 feet on other types of highways.

- G. The use of abbreviations is discouraged. The entire word should be spelled out whenever space permits.

- H. When abbreviations are used, they should be easily understood (see pages 6K-ad through 6K-ag).

Option

The message sign panel may vary in size.

Standard

Portable Changeable Message Signs shall meet the requirements detailed in Table 6F-2.

There are three types of Portable Changeable Message Signs as described in Table 6F-2.

Mn Rev. 7

Requirements	Type A	Type B	Type C
Line(s) of Message	1 Line	2 Lines	3 Lines
Typical Mounting	Vehicle Mounted	Vehicle or Trailer Mounted	Trailer Mounted
Allowed Usage	Emergency and Incident Management	Advance Warning	Advance Warning and Advance Notice
Legibility Distance Requirements	Legible at 350 feet	Legible at 750 feet	Legible at 900 feet
Minimum Character Height	10 inches	≤ 40 mph* = 14 inches ≥ 45 mph* = 18 inches	18 inches
Maximum Number of Displays	1	≤ 40 mph* = 3 ≥ 45 mph* = 2	≤ 40 mph* = 3 ≥ 45 mph* = 2
Message Cycle	Constant	At least 2 seconds per display	At least 2 seconds per display
Minimum Sign Height to Bottom of Sign Panel	5 feet (rural) 7 feet (urban)	5 feet (rural) 7 feet (urban)	5 feet (rural) 7 feet (urban)
Minimum PCMS Spacing	500 feet	1000 feet	1000 feet

* Posted speed limit prior to work starting.

The width-to-height ratio of the sign characters should be between 0.7 and 1.0. The stroke width-to-height ratio should be 0.2.

Mn Rev. 7

Mn Rev. 7

Table 6F-2 Specifications for Portable Changeable Message Sign Use

Standard

When the word messages shown in Tables 1A-1 or 1A-2 need to be abbreviated on a portable changeable message sign, the provisions described in Section 1A.15 shall be followed.

In order to maintain legibility, portable changeable message signs shall automatically adjust their brightness under varying light conditions.

The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable.

Portable changeable message signs shall be equipped with a power source and a battery back-up to provide continuous operation when failure of the primary power source occurs.

The mounting of portable changeable message signs on a trailer, a large truck, or a service patrol truck shall be such that the bottom of the message sign shall be a minimum of 7 feet above the roadway in urban areas and 5 feet above the roadway in rural areas when it is in the operating mode.

Guidance

Portable changeable message signs should be used as a supplement to and not as a substitute for conventional signs and pavement markings.

When portable changeable message signs are used for route diversion, they should be placed far enough in advance of the diversion to allow road users ample opportunity to perform necessary lane changes, to adjust their speed, or to exit the affected highway.

Portable changeable message signs should be sited and aligned to provide maximum legibility and to allow time for road users to respond appropriately to the portable changeable message sign message.

Portable changeable message signs should be placed off the shoulder.

Standard

If a Portable Changeable Message sign is placed on the shoulder of the roadway, it shall be placed a minimum of 4 feet from the edge of the traveled lane, and it shall be delineated with a partial shoulder closure taper. If the 4 foot clearance cannot be met, then a full shoulder closure shall be provided.

Guidance

When portable changeable message signs are not being used to display TTC messages, they should be relocated such that they are outside of the clear zone or shielded behind a traffic barrier and turned away from traffic. If relocation or shielding is not practical, they should be delineated with retroreflective TTC devices.

Portable changeable message sign trailers should be delineated on a permanent basis by affixing retroreflective material, known as conspicuity material, in a continuous line on the face of the trailer as seen by oncoming road users.

Standard

If a Portable Changeable Message Sign is used as an arrow board, it shall meet all the requirements of an arrow board and shall be used solely as an arrow board.

6F.61 Arrow Boards

Standard

An arrow board shall be a sign with a matrix of elements capable of either flashing or sequential displays. This sign shall provide additional warning and directional information to assist in merging and controlling road users through or around a TTC zone.

Guidance

An arrow board in the arrow or chevron mode should be used to advise approaching traffic of a lane closure along major multi-lane arterial roadways in situations involving heavy traffic volumes, high speeds, and/or limited sight distances, or at other locations and under other conditions where road users are less likely to expect such lane closures.

If used, an arrow board should be used in combination with appropriate signs, channelizing devices, or other TTC devices.

Arrow boards should be placed off the shoulder whenever possible.

Standard

If an arrow board is placed on the shoulder of the roadway, it shall be placed a minimum of 4 feet from the edge of the traveled lane, and it shall be delineated with an appropriate shoulder closure taper.

Arrow boards shall meet the minimum size, legibility distance, number of elements, and other specifications shown in Figure 6F-6.

Support

Type A arrow boards are appropriate for use on low-speed urban streets. Type B arrow boards are appropriate for intermediate-speed facilities and for maintenance or mobile operations on high-speed roadways. Type C arrow boards are intended to be used on high-speed, high-volume motor vehicle traffic control projects. Type D arrow boards are intended for use on vehicles authorized by the State or local agency.

Standard

A high-level warning device shall consist of a minimum of two flags with or without a Type B high-intensity flashing warning light. The distance from the roadway to the bottom of the lens of the light and to the lowest point of the flag material shall be not less than 8 feet. The flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color.

Option

An appropriate warning sign may be mounted below the flags.

Support

High-level warning devices are most commonly used in high-density road user situations to warn road users of short-term operations.

6F.63 Channelizing Devices

Standard

Designs of various channelizing devices shall be as shown in Figure 6F-7. All channelizing devices exposed to vehicular traffic shall be crashworthy.

Support

The function of channelizing devices is to warn road users of conditions created by work activities in or near the roadway and to guide road users. Channelizing devices include cones, tubular markers, vertical panels, drums, barricades, and longitudinal channelizing devices.

Channelizing devices provide for smooth and gradual vehicular traffic flow from one lane to another, onto a bypass or detour, or into a narrower traveled way. They are also used to channelize vehicular traffic away from the work space, pavement drop-offs, pedestrian or shared-use paths, or opposing directions of vehicular traffic.

Standard

Devices used to channelize pedestrians shall be detectable to users of long canes and visible to persons having low vision.

Where channelizing devices are used to channelize pedestrians, there shall be continuous detectable bottom and top surfaces to be detectable to users of long canes. The bottom of the bottom surface shall be no higher than 2 inches above the ground. The top of the top surface shall be no lower than 32 inches above the ground.

Option

A gap not exceeding 2 inches between the bottom rail and the ground surface may be used to facilitate drainage.

Guidance

Where multiple channelizing devices are aligned to form a continuous pedestrian channelizer, connection points should be smooth to optimize long-cane and hand trailing.

Standard

There are three types of channelizing devices, Type A, B, and C as shown in Figure 6F-7.

The spacing, and the appropriate MN MUTCD section for each channelizing device is shown in Table 6F-2.

Guidance

The spacing between Type A and Type B channelizing devices should not exceed a distance in feet equal to 1.0 times the speed limit prior to work starting in mph when used for taper channelization, and a distance in feet equal to 2.0 times the speed limit prior to work starting in mph when used for tangent channelization.

When channelizing devices have the potential of leading vehicular traffic out of the intended vehicular traffic space as shown in Layout 6J-4, the channelizing devices should be extended a distance in feet of 2.0 times the speed limit in mph beyond the downstream end of the transition area.

Support

The spacing of channelizing devices shown in the TTC layouts are based on the distances contained in Table 6F-3.

Option

Warning lights (see Section 6F.83) may be added to channelizing devices in areas with frequent fog, snow, or severe roadway curvature, or where visual distractions are present.

Standard

Warning lights shall flash when placed on channelizing devices used alone or in a cluster to warn of a condition. Except for the sequential flashing warning lights discussed in the following options and Standard paragraphs, warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.

Option

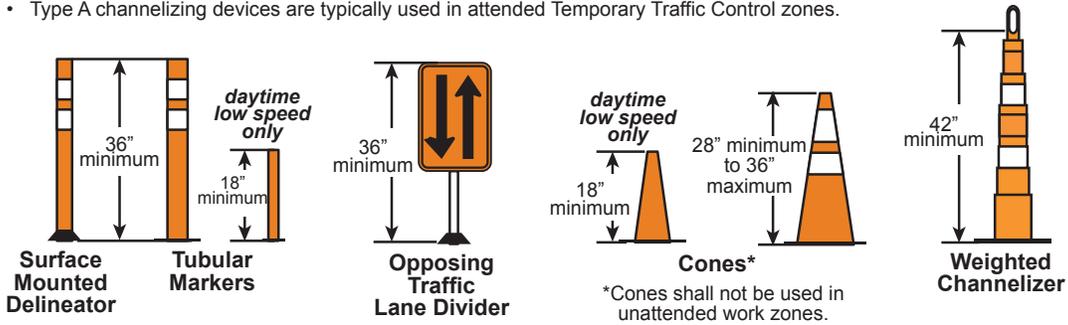
A series of sequential flashing warning lights may be placed on channelizing devices that form a merging taper in order to increase driver detection and recognition of the merging taper.

Standard

When used, the successive flashing of the sequential warning lights shall occur from the upstream end of the merging taper to the downstream end of the merging taper in order to identify the desired vehicle path. Each warning light in the sequence shall be flashed at a rate of not less than 55 nor more than 75 times per minute.

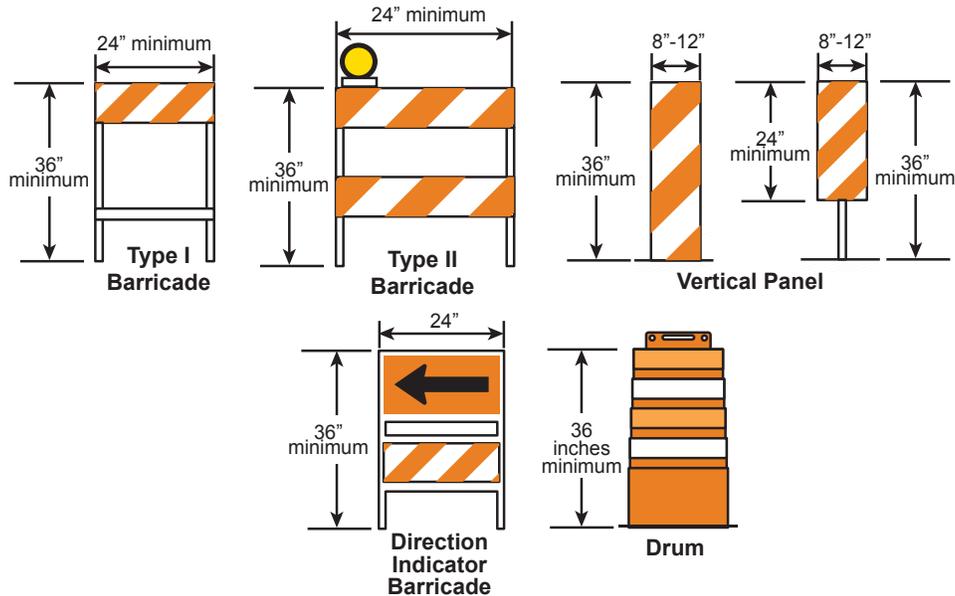
TYPE A CHANNELIZERS

- Type A channelizing devices are typically used in attended Temporary Traffic Control zones.



TYPE B CHANNELIZERS

- Channelizers used on high speed roadways shall have a minimum of 270 square inches of retroreflective area facing road users.
- Orange diagonals shall slope down toward the traffic side.
- Type B channelizing devices shall be used if the Temporary Traffic Control zone will be installed for more than 12 hours or if it is left unattended. Weighted channelizers may be used in lieu of a Type B channelizer with the permission of the road authority.
- Type A Flashing Warning Lights may be used - place on the side with traffic.



TYPE C CHANNELIZER

- Orange diagonals shall slope down toward the traffic side.
- Signs mounted on Type III barricades should not cover more than 50 percent of the top two rails or 33 percent of the total area of the three rails.
- Type A Flashing Warning Lights may be used - place on the side with traffic.

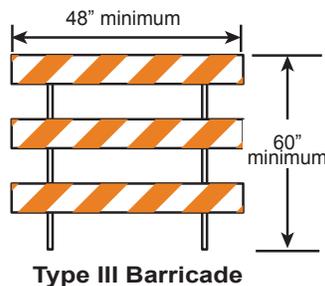


Figure 6F-7 Channelizing Devices

Page intentionally left blank.

Mn Rev. 7 —

Channelizing Device	Device Type	Maximum Allowed Spacing		Recommended Spacing		MN MUTCD Section for complete information
		Transition Spacing	Tangent Spacing	Transition Spacing	Tangent Spacing	
		feet	feet			
Cone	A	S	2S	G	2G	6F.64
Tubular Marker	A	S	2S	G	2G	6F.65
Surface Mounted Delineator	A	S	2S	G	2G	6F.65.1
Weighted Channelizer	A	S	2S	G	2G	6F.65.2
Drum	B	S	2S	G	2G	6F.67
Vertical Panel	A	S	2S	G	2G	6F.66
Type I Barricade	B	S	2S	G	2G	6F.68
Type II Barricade	B	S	2S	G	2G	6F.68
Type III Barricade	C	N/A	20 S	N/A	20 G	6F.68
Direction Indicator Barricade	B	S	20 S	G	20 G	6F.69
Opposing Traffic Divider	A	S	2S	G	2G	6F.76

Notes:

N/A - Not Applicable

S - Posted speed limit (in mph) prior to work starting

G - Recommended spacing guide number for Field Manual

G = 25 feet for low speed roads (S of 40 mph or less)

G = 50 feet for high speed roads (S of 45 mph or greater)

Table 6F-3 Recommended Spacing of Type A, B, and C Channelizing Devices

The retroreflective material used on channelizing devices shall have a smooth, sealed outer surface that will display a similar color day or night.

Option

The name and telephone number of the highway agency, contractor, or supplier may be displayed on the non-retroreflective surface of all types of channelizing devices.

Standard

The letters and numbers of the name and telephone number shall be non-retroreflective and not over 2 inches in height.

Guidance

Particular attention should be given to maintaining the channelizing devices to keep them clean, visible, and properly positioned at all times.

Standard

Devices that are damaged or have lost a significant amount of their retroreflectivity and effectiveness shall be replaced (see Quality Standards in Section 6K).

6F.64 Cones

Standard

Cones shall be predominantly orange and shall be made of a material that can be struck without causing damage to the impacting vehicle (see Figure 6F-7). For daytime and low-speed roadways, cones shall be not less than 18 inches in height. When cones are used on freeways and other high-speed highways or at night on all highways, or when more conspicuous Guidance is needed, cones shall be a minimum of 28 inches in height.

For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retro-reflectorization of cones that are 28 to 36 inches in height shall be provided by a 6-inch wide white band located 3 to 4 inches from the top of the cone and an additional 4-inch wide white band located approximately 2 inches below the 6-inch band.

If the equipment travels on or crosses the roadway, it should be equipped with appropriate flags, flashing lights, and/or a SLOW MOVING VEHICLE symbol. If vehicles are using the shoulder, a ROAD WORK AHEAD (W20-1) or SHOULDER WORK (W21-5) sign is appropriate.

6G.7 Work on the Shoulder with No Encroachment

Support

The provisions of this Section apply to short-term through long-term stationary operations.

Guidance

Parking lanes should be treated the same as shoulders. They should be posted for any restrictions at least 24 hours prior to commencing work.

Standard

If the parking lane is normally open to vehicle travel during the time of day the closure will be in effect, the parking lane shall be considered a traveled lane.

When a highway shoulder is occupied, warning is needed to advise the driver and protect the workers. A single warning sign SHOULDER WORK or ROAD WORK AHEAD shall be used.

When paved shoulders having a width of 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct motor vehicle traffic to remain within the traveled way.

Guidance

When paved shoulders having a width of 8 feet or more are closed on freeways and expressways, road users should be warned about potential disabled vehicles that cannot get off the traveled way. An initial general warning sign, such as ROAD WORK AHEAD (W20-1), should be used, followed by a RIGHT or LEFT SHOULDER CLOSED (W21-5a) sign. Where the downstream end of the shoulder closure extends beyond the distance that can be perceived by road users, a supplementary plaque bearing the message NEXT XX FEET (W16-4P) or NEXT XX MILES (W7-3aP) should be placed below the SHOULDER CLOSED (W21-5a) sign. On multi-lane, divided highways, signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.

When an improved shoulder is closed on a high-speed roadway, it should be treated as a closure of a portion of the

road system because road users expect to be able to use it in emergencies. Road users should be given ample advance warning that shoulders are closed for use as refuge areas throughout a specified length of the approaching TTC zone. The sign(s) should read SHOULDER CLOSED (W21-5a) with distances indicated. The work space on the shoulder should be closed off by a taper or channelizing devices with a length of $1/3 L$ using the formulas in Tables 6C-3 and 6C-4.

When the shoulder is not occupied but work has adversely affected its condition other warning signs and devices are appropriate. The LOW SHOULDER (W8-9), NO SHOULDER (W8-23), HIGH SHOULDER (W21-X9) or SOFT SHOULDER (W8-4) sign should be used. See Figures 6K-3, 4, and 5 in the Field Manual for longitudinal drop offs and Sections 6F-44.2 through 6F-44.4. In areas where the speed limit is greater than 30 mph and the condition extends over a distance in excess of one mile, the sign should be repeated at one mile intervals. In areas where the speed limit is 30 mph or less, the sign should be repeated at 1/4 mile increments.

Option

In addition, a supplementary plaque bearing the message NEXT XX MILES (W7-3aP) may be placed below the first such warning sign. Temporary traffic barriers may be needed to inhibit encroachment of errant vehicles into the work space and to protect workers.

Guidance

Signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.

Standard

When used for shoulder work, arrow boards shall operate only in the caution mode.

Option

If work is directly adjacent to the travel lane, workers need to be protected. In some instances, this may require the use of portable barriers.

6G.8 Work on the Shoulder with Minor Encroachment

Support

Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Mn Rev. 3
Mn Rev. 5
Mn Rev. 7

Guidance

When work takes up part of a lane, vehicular traffic volumes, vehicle mix (buses, trucks, cars, and bicycles), speed, and capacity should be analyzed to determine whether the affected lane should be closed. Unless the lane encroachment permits a remaining lane width of 10 feet, the lane should be closed.

Truck off-tracking should be considered when determining whether the minimum lane width of 10 feet is adequate.

Traffic should not be directed onto a lane that is only partially paved.

Option

A lane width of 9 feet may be used for short-term stationary work on intermediate volume, low-speed roadways when vehicular traffic does not include longer and wider heavy commercial vehicles.

6G.9 Work Within the Median

Support

Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Option

If the work is in a narrow median of a divided highway, traffic control for both directions of travel may be necessary.

Guidance

If work in the median of a divided highway is within 15 feet from the edge of the traveled way for either direction of travel, TTC should be used through the use of advance warning signs and channelizing devices.

If the work is long term, the use of portable barriers should be considered.

6G.9.1 Detours and Diversions

Support

Detour signing is usually designed by the traffic engineer with authority over the closed roadway because it is considered a traffic routing problem. Detour signs are used to direct traffic onto another roadway. At diversions, road users are directed onto a temporary roadway or alignment placed within or adjacent to the right-of-way. Typical applications for detouring or diverting road users on two-lane highways are shown in Layouts 6J-16, 6J-17, and 6J-18. Layout 6J-15 illustrates the controls around an area where a section of roadway has been closed and a diversion has been constructed. Channelizing devices and pavement markings are used to indicate the transition to the temporary roadway.

Guidance

A diversion (bypass) should be designed the same as a crossover (see Section 6G.16).

Option

A diversion may carry either one direction or both directions of traffic.

Guidance

When the detour is long, Detour (M4-8, M4-9) signs should be installed periodically and at major intersections to remind and reassure drivers that they are still on a detour.

When a roadway is closed at some point beyond the detour, traffic should be advised as to what location the road is open. If local road users are allowed to use the roadway up to the closure, the ROAD CLOSED XX MILES AHEAD, LOCAL TRAFFIC ONLY (R11-3a) sign should be used. The portion of the road open to local road users should have adequate signing, marking, and delineation.

Detours should be signed so that traffic will be able to get through the entire detour area and back to the original roadway.

When an entire roadway is closed, as illustrated in Layout 6J-19, a detour should be provided and road users should be warned in advance of the closure, which in this example is a closure 16 km (10 mi) from the intersection.

6G.10 Work Within the Traveled Way of a Two-Lane Highway

Support

Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Techniques for one lane, two-way traffic control are described in Section 6C-10.

Standard

When one lane of a two lane road is closed, the remaining lane shall accommodate both lanes of travel. A minimum lane width of 10 feet shall be maintained at all times (see Section 6H-3).

Option

On intermediate volume residential streets, traffic may be self regulating.

Where conditions permit, parking may be prohibited and traffic shifted into the parking lanes..

Flagger may be used as shown in Layout 6K-26.

STOP/YIELD sign control may be used on roads with low traffic volumes as shown in Layout 6K-20.

A temporary traffic control signal may be used as shown in Layout 6J-19.

6G.10.1 Work Within the Traveled Way of a Rural Highway

Option

For short term temporary traffic control zones that cover a relatively long segment of roadway (up to 3 miles) but do not meet the requirements for a mobile temporary traffic control zone, flagger signs may be installed at one mile increments.

Standard

A supplementary plaque indicating NEXT X MILES shall be used.

Guidance

Crossroads should be adequately signed for any driver entering the temporary traffic control zone from the crossroad. For work in intersections, see Section 6G.13.

Standard

The driver expects to enter a turn lane at or near the posted speed limit. Therefore it is necessary to provide adequate advance warning of work in the turn lane.

6G.11 Work Within the Traveled Way of an Urban Street

Support

Chapter 6D and Sections 6F.74 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

In urban TTC zones, decisions are needed on how to control vehicular traffic, such as how many lanes are required, whether any turns need to be prohibited at intersections, and how to maintain access to business, industrial, and residential areas.

Pedestrian traffic needs separate attention. Chapter 6D contains information regarding pedestrian movements near TTC zones.

Standard

If the TTC zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided (see Part 9).

Where transit stops are affected or relocated because of work activity, both pedestrian and vehicular access to the affected or relocated transit stops shall be provided.

Guidance

If a designated bicycle route is closed because of the work being done, a signed alternate route should be provided. Bicyclists should not be directed onto the path used by pedestrians.

Worksites within the intersection should be protected against inadvertent pedestrian incursion by providing detectable channelizing devices.

Support

Utility work takes place both within and outside the roadway to construct and maintain services such as power, gas, light, water, or telecommunications. Operations often involve intersections, since that is where many of the network junctions occur. The work force is usually small, only a few vehicles are involved, and the number and types of TTC devices placed in the TTC zone is usually minimal.

Standard

All TTC devices shall be retroreflective or illuminated if utility work is performed during nighttime hours.

Support

TTC zones in urban areas present many problems. Frequent intersections and driveways, parking, congestion, visual clutter and lack of space to install signs make the devices more difficult to install.

Option

Engineering judgment is required to modify the typical layouts for specific situations. These modifications usually include variations in the spacing of devices to provide adequate sight distance for the driver. Modifications may also include the use of high level warning devices in urban areas, in place of or in addition to the work vehicle or Type III barricade.

Guidance

As discussed under short-duration projects, however, the reduced number of devices in utility work zones should be offset by the use of high-visibility devices, such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles or high-level warning devices.

6G.12 Work Within the Traveled Way of a Multi-Lane, Non-Access Controlled Highway

Support

Chapter 6D and Sections 6F.74 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Work on multi-lane (two or more lanes of moving motor vehicle traffic in one direction) highways is divided into right-lane closures, left-lane closures, interior-lane closures, multiple-lane closures, and closures on five-lane roadways.

Standard

When a lane is closed on a multi-lane road for other than a mobile operation, a transition area containing a merging taper shall be used.

Guidance

When justified by an engineering study, temporary traffic barriers (see Section 6F.70) should be used to prevent incursions of errant vehicles into hazardous areas or work space.

If morning and evening peak hour vehicular traffic volumes in the two directions are uneven and the greater volume is on the side where the work is being done in the right-hand lane, consideration should be given to closing the inside lane for opposing vehicular traffic and making the lane available to the side with heavier vehicular traffic, as shown in Figure 6H-31.

If the larger vehicular traffic volume changes to the opposite direction at a different time of the day, the TTC should be changed to allow two lanes for opposing vehicular traffic by moving the devices from the opposing lane to the center line. When it is necessary to create a temporary center line that is not consistent with the pavement markings, channelizing devices should be used and closely spaced.

Option

If the work activity can be contained entirely within the left (or inside) lane, it may be appropriate to close only that lane on low speed streets or highways.

When closing a left-hand lane on a multi-lane undivided road, as vehicular traffic flow permits, the two interior lanes may be closed, as shown in Layout 6K-43 to provide drivers and workers additional lateral clearance and to provide access to the work space.

Standard

When only the left-hand lane is closed on undivided roads, channelizing devices shall be placed along the center line as well as along the adjacent lane.

Guidance

Channelizing devices should be placed along the centerline and outside of the work space to give advance warning to the opposing traffic.

When an interior lane is closed, an adjacent lane should also be considered for closure to provide additional space for vehicles and materials and to facilitate the movement of equipment within the work space.

When multiple lanes in one direction are closed, a capacity analysis should be made to determine the number of lanes needed to accommodate motor vehicle traffic needs. Vehicular traffic should be moved over one lane at a time. As shown in Layout 6K-65, the tapers should be separated by a distance of $2L$, with L being determined by the formulas in Table 6C-2.

Option

If operating speeds are 40 mph or less and the space approaching the work area does not permit moving traffic over one lane at a time, a single continuous taper may be used.

Standard

When a directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices at intersections within the temporary two-lane, two-way operations section shall be covered, removed, or obliterated.

Option

When half the road is closed on an undivided highway, both directions of vehicular traffic may be accommodated as shown in Layout 6K-44. When both interior lanes are closed, temporary traffic controls may be used as indicated in Layout 6K-43. When a roadway must be closed on a divided highway, a median crossover may be used (see Section 6G.16).

An alternative is to close the two center lanes to give motorists and workers additional protection and to provide easier access to the work space. Overall safety needs, evaluated on the basis of existing traffic volumes and speeds in each direction, is the main factor for determining alternatives.

Support

Temporary traffic control for lane closures on five-lane roads is similar to other multi-lane undivided roads. Layouts 6K-37 and 6K-38 can be adapted for use on five-lane roads. Layout 6K-41 can be used on a five-lane road for short duration and mobile operations.

Mn Rev. 7

Mn Rev. 7

Mn Rev. 7

Guidance

For roadways having either center two-way left turn lanes or exclusive left turn lanes, a transition area should be provided for vehicles entering or exiting the turn lanes.

6G.13 Work Within the Traveled Way at an Intersection

Support

Chapter 6D and Sections 6F.74 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

The typical layouts for intersections are classified according to the location of the work space with respect to the intersection area (as defined by the extension of the curb or edge lines). The three classifications are near side, far side, and in-the-intersection. Work spaces often extend into more than one portion of the intersection. For example, work in one quadrant often creates a near-side work space on one street and a far-side work space on the cross street. In such instances, an appropriate TTC plan is obtained by combining features shown in two or more of the intersection and pedestrian typical applications.

TTC zones in the vicinity of intersections might block movements and interfere with normal road user flows. Such conflicts frequently occur at more complex signalized intersections having such features as traffic signal heads over particular lanes, lanes allocated to specific movements, multiple signal phases, signal detectors for actuated control, and accessible pedestrian signals and detectors.

Guidance

The effect of the work upon signal operation should be considered, and temporary corrective actions should be taken, if necessary, such as revising signal phasing and/or timing to provide adequate capacity, maintaining or adjusting signal detectors, and relocating signal heads to provide adequate visibility as described in Part 4.

Prior to working in a signalized intersection, the traffic engineering staff having jurisdiction should be contacted for signal timing modifications.

Standard

When work will occur near an intersection where operational, capacity, or pedestrian accessibility problems are anticipated, the highway agency having jurisdiction shall be contacted.

Guidance

For work at an intersection, advance warning signs, devices, and markings should be used on all roadway approaches to the intersection as appropriate.

When work will occur near non-signalized intersections where operational and capacity problems are anticipated, the highway agency having jurisdiction should be contacted.

For work at an intersection, advance warning signs, devices, and markings should be used on all cross streets, as appropriate. The typical applications depict urban intersections on arterial streets. Where the posted speed limit, the off-peak 85th-percentile speed prior to the work starting, or the anticipated speed exceeds 40 mph, additional warning signs should be used in the advance warning area.

Pedestrian crossings near TTC sites should be separated from the worksite by appropriate barriers that maintain the accessibility and detectability for pedestrians with disabilities.

A. Work Space on the Near Side of Intersections

Support

Near-side work spaces, are simply handled as a midblock lane closure. When a lane is closed on the approach side of an intersection, standard lane closure and taper techniques apply. A problem that might occur with near-side lane closure is a reduction in capacity, which during certain hours of operation could result in congestion and backups.

Option

When near-side work spaces are used, an exclusive turn lane may be converted for use as a through traffic lane.

Where space is restricted in advance of near-side work spaces, as with short block spacings, two warning signs may be used in the advance warning area, and a third action-type warning or a regulatory sign (such as Keep Left sign) may be placed within the transition area.

B. Work Space on the Far Side of Intersections

Support

Far-side work spaces require additional treatment because road users typically enter the activity area by straight-through and left- or right-turning movements.

Guidance

When a lane through an intersection must be closed on the far side, it should also be closed on the near-side approach to preclude merging movements within the intersection. Merging movements within the intersection should be avoided. Whenever possible, a taper should be provided in the closed lane for turning vehicles.

Option

If there are a significant number of vehicles turning from a near-side lane that is closed on the far side, the near-side lane may be converted to an exclusive turn lane.

C. Work Space Within the Intersection

Support

Layout 6K-47 provides guidance on applicable procedures for work performed within the intersection.

Option

If the work is within the intersection, any of the following strategies may be used:

1. A small work space so that road users can move around it, as shown in Figure 6H-26;
2. Flaggers or uniformed law enforcement officers to direct road users, as shown in Figure 6H-27;
3. Work in stages so the work space is kept to a minimum; and
4. Road closures or upstream diversions to reduce road user volumes.

Guidance

Depending on road user conditions, a flagger(s) and/or a uniformed law enforcement officer(s) should be used to control road users.

6G.14 Work Within the Traveled Way of a Freeway or Expressway

Support

Due to the physical characteristics of these facilities, unique problems are encountered. Work under high-speed, high-volume motor vehicle traffic on a controlled access highway is complicated by the roadway design and operational features.

The presence of median dividers that establish separate roadways for directional traffic may also prohibit the closure of that roadway or the diverting of traffic to other lanes. Lack of access to and from adjacent roadways prohibits rerouting of traffic away from the activity area in many cases.

A major consideration in the establishment of traffic control is the vehicular speed differential which exists and the limited time available for drivers to react safely to unusual conditions while still providing a work space that protects workers.

Other conditions exist where work must be limited tonight hours, thereby necessitating increased use of warning lights, illumination of work spaces, and advance warning systems.

Problems of TTC might occur under the special conditions encountered where vehicular traffic must be moved through or around TTC zones on high-speed, high-volume roadways. Although the general principles outlined in the previous Sections of this Manual are applicable to all types of highways, high-speed, access-controlled highways need special attention in order to accommodate vehicular traffic while also protecting road users and workers.

The road user volumes, road vehicle mix (buses, trucks, cars, and bicycles, if permitted), and speed of vehicles on these facilities require that careful TTC procedures be implemented, for example, to induce critical merging maneuvers well in advance of work spaces and in a manner that creates minimum turbulence and delay in the vehicular traffic stream. These situations often require more conspicuous devices than specified for normal rural highway or urban street use. However, the same important basic considerations of uniformity and Standardization of general principles apply for all roadways.

Work under high-speed, high-volume vehicular traffic on a controlled access highway is complicated by the roadway design and operational features. The presence of a median that establishes separate roadways for directional vehicular traffic flow might prohibit the closing of one of the roadways or the diverting of vehicular traffic to the other roadway. Lack of access to and from adjacent roadways prohibits rerouting of vehicular traffic away from the work space in many cases. Other conditions exist where work must be limited to night hours, thereby necessitating increased use of warning lights, illumination of work spaces, and advance warning systems.

TTC for a typical lane closure on a divided highway is shown in Layout 6K-56. Temporary traffic controls for short duration and mobile operations on freeways are shown in Layout 6K-49. A typical application for shifting vehicular traffic lanes around a work space is shown in Layout 6K-61. TTC for multiple and interior lane closures on a freeway is shown in Layouts 6K-65 and 6K-59.

Guidance

The method for closing an interior lane when the open lanes have the capacity to carry vehicular traffic should be as shown in Layout 6K-56.

6G.15 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway

Support

Two-lane, two-way operation on one roadway of a normally divided highway is a typical procedure that requires special consideration in the planning, design, and work phases, because unique operational problems (for example, increasing the risk of head-on crashes) can arise with the two-lane, two-way operation.

Standard

When two-lane, two-way traffic control must be maintained on one roadway of a normally divided highway, opposing vehicular traffic shall be separated with either temporary traffic barriers (concrete safety-shape or approved alternate), channelizing devices, or a temporary raised island throughout the length of the two-way operation. The use of markings and complementary signing, by themselves, shall not be used.

Support

Layouts 6J-3, 6J-4, and 6J-5 shows the procedure for two-lane, two-way operation. Treatments for entrance and exit ramps within the two-way roadway segment of this type of work are shown in Layouts 6J-7 and 6J-8.

Guidance

The following items should be considered during the decision-making process:

- A. Suitable detours
- B. Characteristics of the traffic
- C. Intersection closures and/or the perpetuation of turn lanes
- D. Maintaining traffic on the shoulder
- E. Construction of temporary lanes in the median
- F. Construction of emergency pullouts in the two-lane, two-way section
- G. Closing only one directional lane
- H. Hazards to temporary traffic control zone personnel
- I. Shortest contract time
- J. Most efficient construction practice and least cost
- K. Width or height restrictions
- L. Condition of the pavement and the shoulders in the proposed TLTWO section.

Standard

The traffic control plan shall include provisions for separation of opposing traffic whenever two-way traffic must be maintained on one roadway of a normally divided highway. When traffic must be maintained on one roadway of a normally divided highway, opposing traffic shall be separated either with portable barriers, or with channelizing devices throughout the length of the two-way operation.

Option

Striping, raised pavement markers, and signing, either alone or in combination, are used to complement separation devices. Alone or in combination, they do not meet the requirements for traffic separation.

Standard

When the directional roadway is closed, inapplicable WRONG WAY signs and markings, and other existing traffic control devices within the temporary two-lane, two-way operations section, and at intersections shall be covered, removed, or obliterated.

Support

In a TLTWO, diverting traffic to the opposing left lane exposes the traffic to unprotected roadside hazards. These hazards may include unprotected bridge piers, bridge rail, and guard rail ends.

Standard

Prior to diverting traffic, these roadside hazards shall be delineated and/or protected per the AASHTO Roadside Design Guide.

The TLTWO shall be used only after careful consideration of other available methods of traffic control.

Option

It may be necessary to laterally shift one or more lanes of traffic.

Standard

If more than one lane is being shifted, even for a short term operation, in-place markings shall be covered or removed and temporary markings shall be installed.

6G.16 Crossovers

Guidance

The following are considered good guiding principles for the design of crossovers:

- A. Tapers for lane drops should be separated from the crossovers.
- B. Crossovers should be designed for speeds not less than 10 miles per hour below the posted speed prior to work starting. If unusual site conditions require that a lower design speed be used, the signing should reflect an advisory speed determined by engineering judgment or study.
- C. A good array of channelizing devices, delineators, and full-length, properly placed pavement markings should be used to provide drivers with a clearly defined travel path.
- D. The design of the crossover should accommodate all roadway traffic, including trucks and buses.
- E. A clear area should be provided adjacent to the crossover.

Support

Temporary traffic barriers and the excessive use of TTC devices cannot compensate for poor geometric and roadway cross-section design of crossovers.

6G.17 Interchanges

Guidance

Access to interchange ramps on limited-access highways should be maintained even if the work space is in the lane adjacent to the ramps. Access to exit ramps should be clearly marked and delineated with channelizing devices. For long-term projects, conflicting pavement markings should be removed and new ones placed. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur before ramp closings.

Option

If access is not possible, ramps may be closed by using signs and Type 3 Barricades. As the work space changes, the access area may be changed, as shown in Layout 6K-62. A TTC zone in the exit ramp may be handled as shown in Layout 6K-69.

When a work space interferes with an entrance ramp, a lane may need to be closed on the highway. Work in the entrance ramp may require shifting ramp vehicular traffic. TTC for both operations is shown in Layouts 6K-67 and 6K-68.

Guidance

Egress to exit ramps should be clearly marked and outlined with channelizing devices.

Advance warning sign spacing is dependent upon the length of the ramp and the exact location of signs is determined in the field. Spacing of the signs should be as long as practicable. A minimum lane width of 10 feet on exit ramps should be maintained.

6G.18 Work in the Vicinity of a Grade Crossing

Standard

When grade crossings exist either within or in the vicinity of a TTC zone, lane restrictions, flagging, or other operations shall not create conditions where vehicles can be queued across the tracks. If the queuing of vehicles across the tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the crossing to prevent vehicles from stopping on the tracks, even if automatic warning devices are in place.

Support

Layout 6J-14 shows work in the vicinity of a highway-rail grade crossing.

Guidance

Early coordination with the railroad company or light rail transit agency should occur before work starts.

6G.19 Temporary Traffic Control During Nighttime Hours

Support

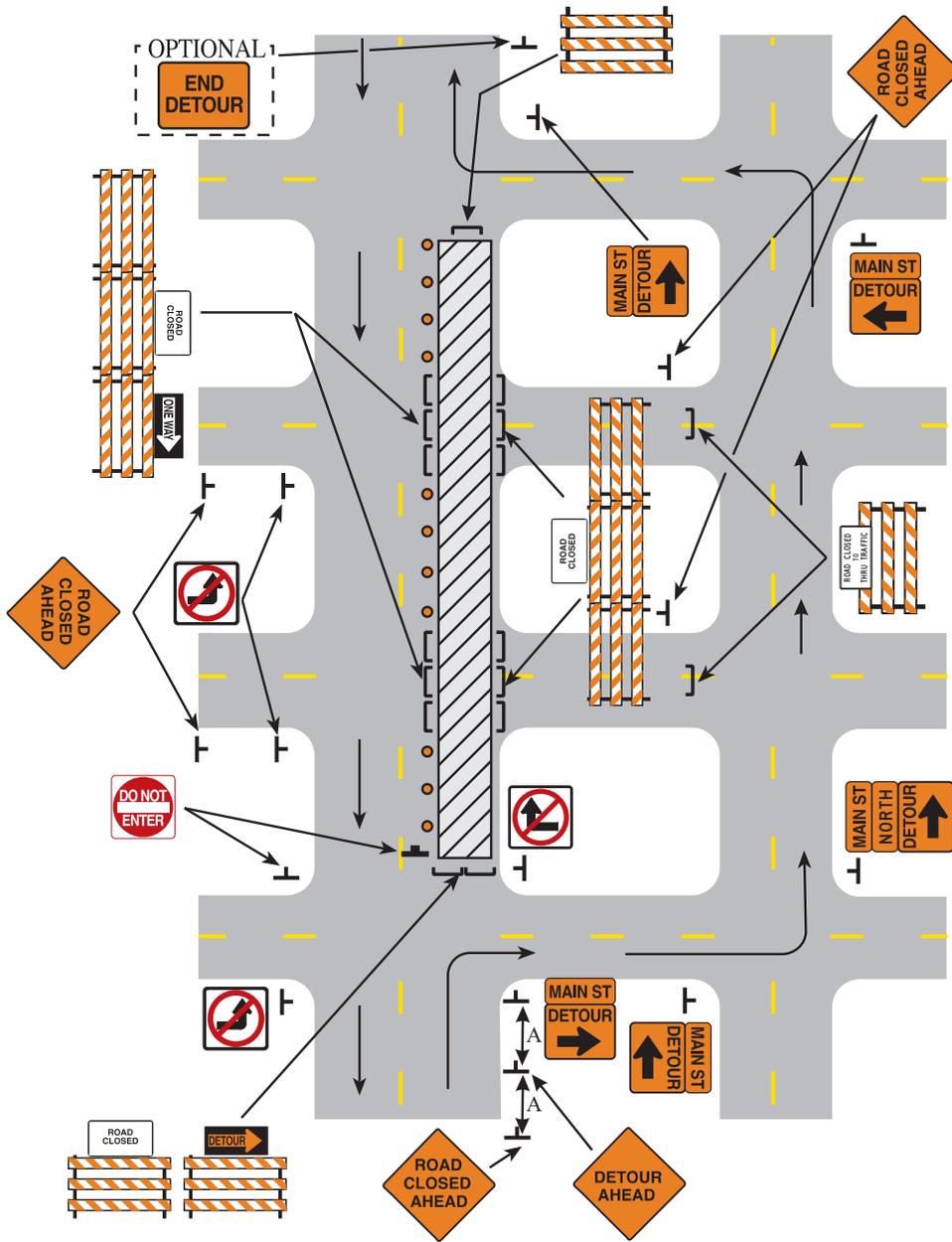
Chapter 6D and Sections 6F.74 and 6G.5 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Conducting highway construction and maintenance activities during night hours could provide an advantage when traditional daytime traffic control strategies cannot achieve an acceptable balance between worker and public safety, traffic and community impact, and constructability. The two basic advantages of working at night are reduced traffic congestion and less involvement with business activities. However, the two basic conditions that must normally be met for night work to offer any advantage are reduced traffic volumes and easy set up and removal of the traffic control patterns on a nightly basis.

Shifting work activities to night hours, when traffic volumes are lower and normal business is less active, might offer an advantage in some cases, as long as the necessary work can be completed and the worksite restored to essentially normal operating conditions to carry the higher traffic volume during non-construction hours.

NOTES:

1. See page iii for Temporary Traffic Control Distance Charts.
2. Additional "DO NOT ENTER" signs may be desirable at intersections with intervening streets.
3. For sidewalk and crosswalk closures, see Layouts 6K-88 and 6K-89.
4. Additional side street signs may be required.



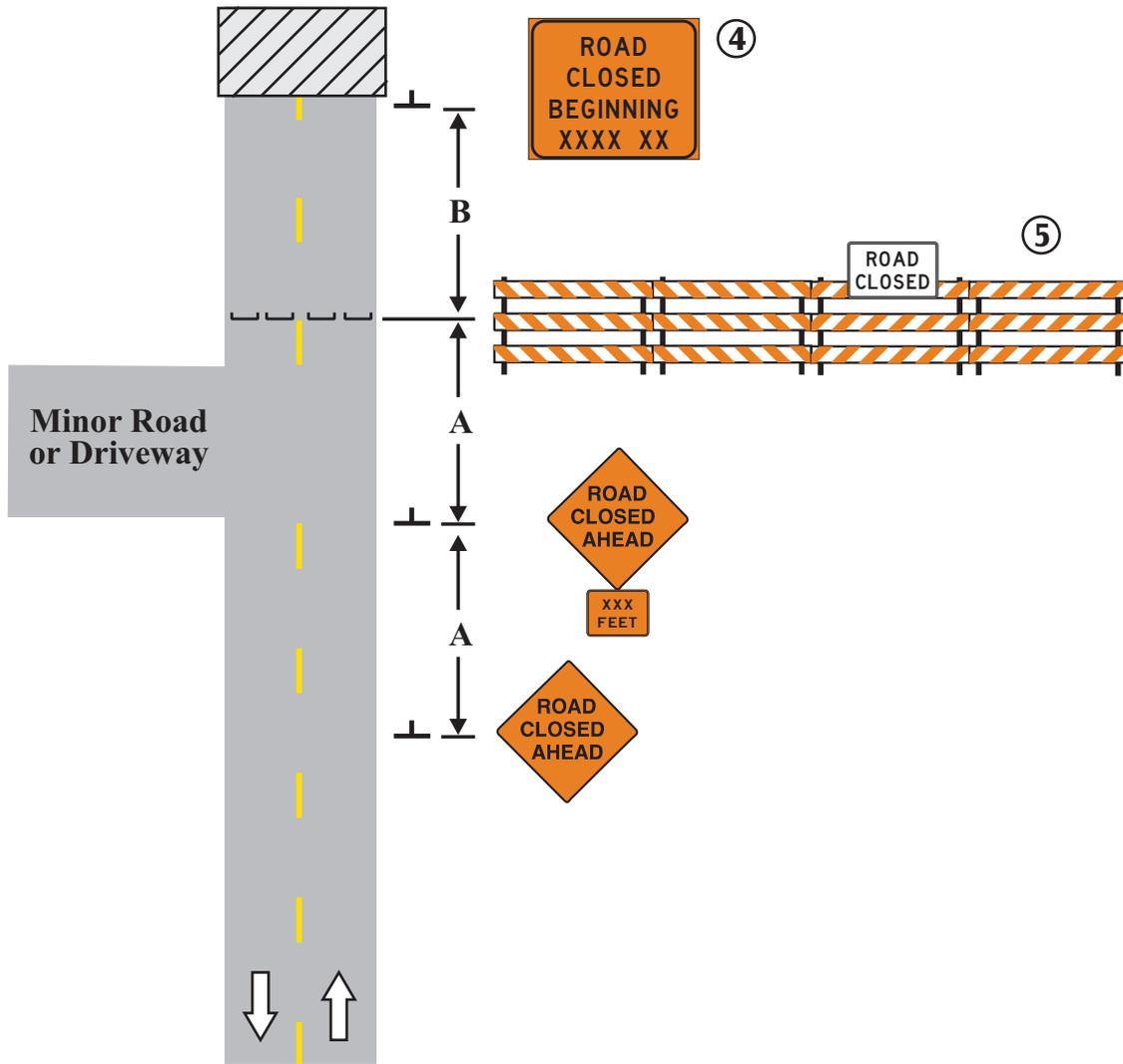
DETOUR FOR ONE TRAVEL DIRECTION

LONG TERM

LAYOUT 6J-19

NOTES:

1. See page iii for Temporary Traffic Control Distance Charts.
2. All devices are shown for one direction. Devices for the other direction should be similar.
3. The Road Authority will determine if a detour is required and specify the detour route.
4. Advance warning signs should be used seven days in advance of the closure.
5. Install at the last driveway or intersection beyond which there is no public access.



TYPICAL SIGNING FOR ROAD CLOSURE

LONG TERM

LAYOUT 6J-20