



**Minnesota Manual
on
Uniform Traffic
Control Devices**

MN

MUTCD

February 2018

**MINNESOTA
MANUAL
ON
UNIFORM
TRAFFIC
CONTROL
DEVICES**



**MN
MUTCD**

February 2018



Office of Traffic, Safety and Technology
1500 West County Road B2 – MS 725
Roseville, MN 55113

February 26, 2018

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

Transmitted herewith is Revision Number 6 (dated February 21, 2018) 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. 97267 amends Commissioner's Orders 93167, 93799, 94040, 94687, and 97233. 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, and 6 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 "Updates Notification Form" found on the website above under "Quick 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 Janelle Anderson, MnDOT, Office of Traffic, Safety and Technology, phone (651) 234-7388, email address: janelle.anderson@state.mn.us.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Jay Hietpas'.

Jay Hietpas, PE
State Traffic Engineer

Equal Opportunity Employer

**REVISIONS TO THE
2011 MINNESOTA UNIFORM TRAFFIC CONTROL DEVICES MANUAL
ORDER NO. 97267**

This is the sixth 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 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.

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

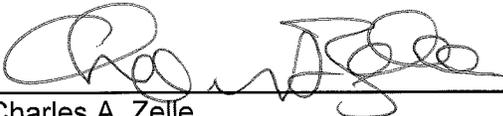
Pursuant to Minnesota Statutes, Section 169.06, subd. 1 (2011), and 169.215, subd. 2 (2011), the Commissioner hereby adopts the revisions listed below:

Record of Revisions or Additions to the MN MUTCD

<u>Revision Number</u>	<u>Date Issued</u>	<u>Pages Revised or Added</u>
6	<u>2/21/18</u>	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.

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, and 97233 dated January 30, 2018.

Signed this 21 day of February 2018.



Charles A. Zelle
Commissioner of Transportation

Minnesota Manual on Uniform Traffic Control Devices

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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

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- use of license plate optical scanning, to automatically deduct the toll from the registered user account, or (2) systems that do not require users to have registered toll accounts because vehicle license plates are optically scanned and invoices for the toll amount are sent through postal mail to the address of the vehicle owner.
60. **Electronic Toll Collection (ETC) Account Only Lane** - a non-attended toll lane that is restricted to use only by vehicles with a registered toll payment account.
 61. **Emergency-Vehicle Hybrid Beacon** - a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist authorized emergency vehicles in entering or crossing a street or highway.
 62. **Emergency-Vehicle Traffic Control Signal** - a special traffic control signal that assigns the right-of-way to an authorized emergency vehicle.
 63. **End-of-Roadway Marker** - a device used to warn and alert road users of the end of a roadway in other than temporary traffic control zones.
 64. **Engineering Judgment** - the evaluation of available pertinent information, and the application of appropriate principles, provisions, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. Engineering judgment shall be exercised by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. Documentation of engineering judgment is not required.
 65. **Engineering Study** - the comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, provisions, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. An engineering study shall be performed by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. An engineering study shall be documented.
 66. **Entrance Gate** - an automatic gate that can be lowered across the lanes approaching a grade crossing to block road users from entering the grade crossing.
 67. **Exact Change Lane (Automatic Lane)** - a non-attended toll lane that has a receptacle into which road users deposit coins totaling the exact amount of the toll. Exact Change lanes at toll plazas typically require vehicles to stop to pay the toll.
 68. **Exit Gate** - an automatic gate that can be lowered across the lanes departing a grade crossing to block road users from entering the grade crossing by driving in the opposing traffic lanes.
 69. **Exit Gate Clearance Time** - for Four-Quadrant Gate systems at grade crossings, the amount of time provided to delay the descent of the exit gate arm(s) after entrance gate arm(s) begin to descend. relocated from Section 8A.01
 70. **Exit Gate Operating Mode** - for Four-Quadrant Gate systems at grade crossings, the mode of control used to govern the operation of the exit gate arms.
 71. **Expressway** - a divided highway with partial control of access.
 72. **Flagger** - a person who actively controls the flow of vehicular traffic into and/or through a temporary traffic control zone using hand-signaling devices or an Automated Flagger Assistance Device (AFAD).
 73. **Flasher** - a device used to turn highway traffic signal indications on and off at a repetitive rate of approximately once per second. relocated
 74. **Flashing** - an operation in which a light source, such as a traffic signal indication, is turned on and off repetitively.
 75. **Flashing-Light Signals** - a warning device consisting of two red signal indications arranged horizontally that are activated to flash alternately when rail traffic is approaching or present at a - grade crossing. relocated from Section 8A.1
 76. **Flashing Mode** - a mode of operation in which at least one traffic signal indication in each vehicular signal face of a highway traffic signal is turned on and off repetitively.
 77. **Freeway** - a divided highway with full control of access.
 78. **Full-Actuated Operation** - a type of traffic control signal operation in which all signal phases function on the basis of actuation. relocated from Section 4A.2
 79. **Gate** - an automatically-operated or manually-operated traffic control device that is used to physically obstruct road users such that they are discouraged from proceeding past a particular point on a roadway or pathway, or such that they are discouraged from entering a particular grade crossing, ramp, lane, roadway, or facility.
 80. **Grade Crossing** - the general area where a highway and a railroad and/or light rail transit route cross at the same level, within which are included the tracks, highway, and traffic control devices for traffic traversing that area.
 81. **Guide Sign** - a sign that shows route designations, destinations, directions, distances, services, points of interest, or other geographical, recreational, or cultural information.

82. **High Occupancy Vehicle (HOV)** - a motor vehicle carrying at least two or more persons, including carpools, vanpools, and buses.
83. **High Speed Roadway** - any street or highway where the posted speed limit is 45 miles per hour or greater.
84. **Highway** - a general term for denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.
85. **Highway-Light Rail Transit Grade Crossing** - the general area where a highway and a light rail transit route cross at the same level, within which are included the light rail transit tracks, highway, and traffic control devices for traffic traversing that area.
86. **Highway-Rail Grade Crossing** - the general area where a highway and a railroad cross at the same level, within which are included the railroad tracks, highway, and traffic control devices for highway traffic traversing that area.
87. **Highway Traffic Signal** - a power-operated traffic control device by which traffic is warned or directed to take some specific action. These devices do not include power-operated signs, steadily-illuminated pavement markers, warning lights (see Section 6F.78), or steady burning electric lamps.
88. **Highway Work Zone** - a segment of highway or street where a road authority or its agent is constructing, reconstructing, or maintaining the physical structure of the roadway, which may include, but is not limited to, shoulders, features adjacent to the roadway, and utilities and highway appurtenances, whether underground or overhead; and any of the following applies: (i) official traffic control devices that indicate the segment of street or highway under construction, reconstruction, or maintenance, are erected; (ii) one or more lanes of traffic are closed; (iii) a flagger is present, (iv) a 24/7 construction speed limit is established; or (v) a workers present speed limit is in effect.
89. **HOV Lane** - any preferential lane designated for exclusive use by high-occupancy vehicles for all or part of a day-including a designated lane on a freeway, other highway, street, or independent roadway on a separate right-of-way.
90. **Hybrid Beacon** - a special type of beacon that is intentionally placed in a dark mode (no indications displayed) between periods of operation and, when operated, displays both steady and flashing traffic control signal indications.
91. **Inherently Low Emission Vehicle (ILEV)** - any kind of vehicle that, because of inherent properties of the fuel system design, will not have significant evaporative emissions, even if its evaporative emission control system has failed.
92. **In-Roadway Lights** - a special type of highway traffic signal installed in the roadway surface to warn road users that they are approaching a condition on or adjacent to the roadway that might not be readily apparent and might require the road users to slow down and/or come to a stop.
93. **Interchange** - a system of interconnecting roadways providing for traffic movement between two or more highways that do not intersect at grade.
94. **Interconnection** - when used in Part 8, the electrical connection between the railroad or light rail transit active warning system and the highway traffic signal controller assembly for the purpose of preemption.
95. **Intermediate Interchange** - an interchange with an urban or rural route that is not a major or minor interchange as defined in this section.
96. **Intersection** - intersection is defined as follows:
- the area embraced within the prolongation or connection of the lateral curb lines, or if none, the lateral boundary lines of the roadways of two highways that join one another at, or approximately at, right angles, or the area within which vehicles traveling on different highways that join at any other angle might come into conflict.
 - the junction of an alley or driveway with a roadway or highway shall not constitute an intersection, unless the roadway or highway at said junction is controlled by a traffic control device.
 - If a highway includes two roadways that are 30 feet or more apart (see definition of Median), then every crossing of each roadway of such divided highway by an intersecting highway shall be a separate intersection.
 - If both intersecting highways include two roadways that are 30 feet or more apart, then every crossing of any two roadways of such highways shall be a separate intersection.
 - At a location controlled by a traffic control signal, regardless of the distance between the separate intersections as defined in (c) and (d) above:
 - If a stop line, yield line, or crosswalk has not been designated on the roadway (within the median) between the separate intersections, the two intersections and the roadway (median) between them shall be considered as one intersection;
 - Where a stop line, yield line, or crosswalk is designated on the roadway on the intersection approach, the area within the crosswalk and/or beyond the designated stop line or yield line shall be part of the intersection; and
 - Where a crosswalk is designated on a roadway on the departure from the intersection, the intersection shall include the area extending to the far side of such crosswalk.
97. **Intersection Control Beacon** - a beacon used only at an intersection to control two or more directions of travel.

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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 At Signal (plaque)	R10-30	2B.54	30 x 36	30 x 36	---	---	---	---
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 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)

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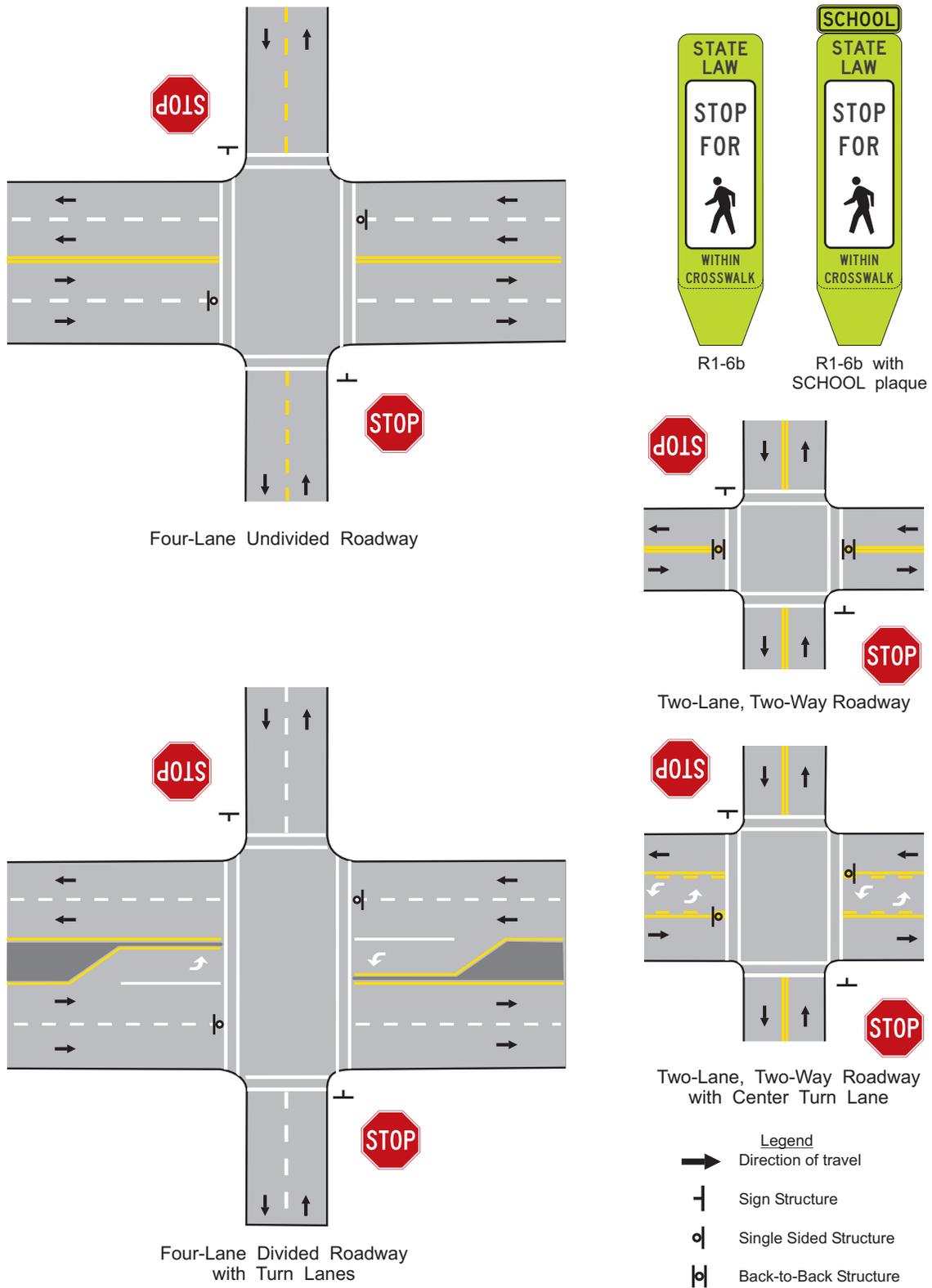


Figure 2B-2. Typical Placement of In-Street Pedestrian Crossing Signs

users about the State law prior to reaching the crosswalk, nor shall it be installed as an educational display that is not near any crosswalk.

The In-Street Pedestrian Crossing sign shall have either the same sign message on the back side or a strip of retroreflective sheeting not less than 2 inches in width. The color of this strip shall be the same as that of the lane line the on which the sign is placed.

~~There shall be only one In-Street Pedestrian Crossing sign installed for each approach to marked crosswalks.~~

GUIDANCE:

If an island (see Chapter 3I) is available, the In-Street Pedestrian Crossing sign, if used, should be placed on the island.

The In-Street Pedestrian Crossing sign should only be installed on roadways with posted speed limits of 35 mph or less and should not impede normal through or turning traffic movements.

OPTION:

If a Pedestrian Crossing (W11-2) warning sign is used in combination with an In-Street or an Overhead Pedestrian Crossing sign, the W11-2 sign with a diagonal downward pointing arrow (W16-7P) plaque may be post-mounted on the right-hand side of the roadway at the crosswalk location.

STANDARD:

The In-Street Pedestrian Crossing sign and the Overhead Pedestrian Crossing sign shall not be used at signalized locations.

The STOP FOR legend shall only be used in States where the State law specifically requires that a driver must stop for a pedestrian in a crosswalk.

The In-Street Pedestrian Crossing sign shall have a black legend (except for the red STOP sign symbols) and border on a white background, surrounded by an outer yellow or fluorescent yellow-green background area. The Overhead Pedestrian Crossing sign shall have a black legend and border on a yellow or fluorescent yellow-green background at the top of the sign and a black legend and border on a white background at the bottom of the sign.

Unless the In-Street Pedestrian Crossing sign is placed on a physical island, the sign support shall be designed to bend over and then bounce back to its normal vertical position when struck by a vehicle.

SUPPORT:

The Provisions of Section 2A.18 concerning mounting height are not applicable for the In-Street Pedestrian Crossing sign.

STANDARD:

The top of an In-Street Pedestrian Crossing sign shall be a maximum of 4 feet above the pavement surface. The top of an In-Street Pedestrian Crossing sign placed in an island shall be a maximum of 4 feet above the island surface.

OPTION:

The In-Street Pedestrian Crossing sign may be used seasonally to prevent damage in winter because of plowing operations, and may be removed at night if the pedestrian activity at night is minimal.

In-Street Pedestrian Crossing signs, Overhead Pedestrian Crossing signs, and Stop Here For Pedestrians signs may be used together at the same crosswalk.

2B.13 Speed Limit Sign (R2-1)



R2-1

STANDARD:

Speed zones (other than statutory speed limits) shall only be established on the basis of an engineering study that has been performed in accordance with traffic engineering practices. The engineering study shall include an analysis of the current speed distribution of free-flowing vehicles.

The Speed Limit (R2-1) sign shall display the limit established by law, ordinance, regulation, or as adopted by the authorized agency based on the engineering study. The speed limits displayed shall be in multiples of 5 mph.

Speed Limit (R2-1) signs, indicating speed limits for which posting is required by law, shall be located at the points of change from one speed limit to another.

At the downstream end of the section to which a speed limit applies, a Speed Limit sign showing the next speed limit shall be installed. Additional Speed Limit signs shall be installed beyond major intersections and at other locations where it is necessary to remind road users of the speed limit that is applicable.

Speed Limit signs indicating the statutory speed limits shall be installed at entrances to the State and, where appropriate, at jurisdictional boundaries in urban areas.

SUPPORT:

Minnesota Statute 169.14 sets forth speed limits to govern all roadways and alleys in the state. Any posted speed limit greater or less than the statutory speed limits must be authorized by the Commissioner of Transportation. Any alteration of statutory speed limits on any public road or street shall be based upon the results of an engineering and traffic investigation.

Minnesota Statute, section 169.14, subd. 5, states that:

When local authorities believe that the existing speed limit upon any street or highway, or part thereof, within their respective jurisdictions and not a part of the trunk highway system is greater or less than is reasonable or safe under existing condition, they may request the commissioner (of transportation) to authorize, upon the basis of an engineering and traffic investigation, the erection of appropriate signs designating a reasonable and safe speed limit thereat, which speed limit shall be effective when such signs are erected.

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.

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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.

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R2-5a



R2-5b



R2-5c



R2-X1

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, Safety and Technology (OTST).

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 OTST.

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:

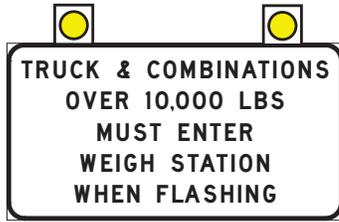
A Night Speed Limit (R2-3P) plaque should be reversed using a white retroreflectorized legend and border on a black background.

OPTION:

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

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2B.60 Weigh Station Signs (R13 Series)



R13-X1

GUIDANCE:

An R13-X1 sign with the legend TRUCKS & COMBINATIONS OVER 10,000 LBS MUST ENTER WEIGH STATION WHEN FLASHING should be used to direct appropriate traffic into a weigh station.

The R13-X1 sign should be supplemented by the D8 series of guide signs (see Section 2D.49).

OPTION:

The reverse color combination, a white legend and border on a black background, may be used for the R13-X1 sign.

2B.61 Truck Route Sign (R14-1)



R14-1



M4-4

GUIDANCE:

The TRUCK ROUTE (R14-1) sign should be used to mark a route that has been designated to allow truck traffic.

OPTION:

On a numbered highway, the TRUCK auxiliary (M4-4) sign may be used (see Section 2D.20).

2B.62 Hazardous Material Signs (R14-2, R14-3)



R14-2



R14-3

OPTION:

The Hazardous Material Route (R14-2) sign may be used to identify routes that have been designated by proper authority for vehicles transporting hazardous material.

On routes where the transporting of hazardous material is prohibited, the Hazardous Material Prohibition (R14-3) sign may be used.

GUIDANCE:

If used, the Hazardous Material Prohibition sign should be installed on a street or roadway at a point where vehicles transporting hazardous cargo have the opportunity to take an alternate route.

2B.63 National Network Signs (R14-4, R14-5)



R14-4



R14-5

SUPPORT:

The signing of the National Network routes for trucking is optional.

STANDARD:

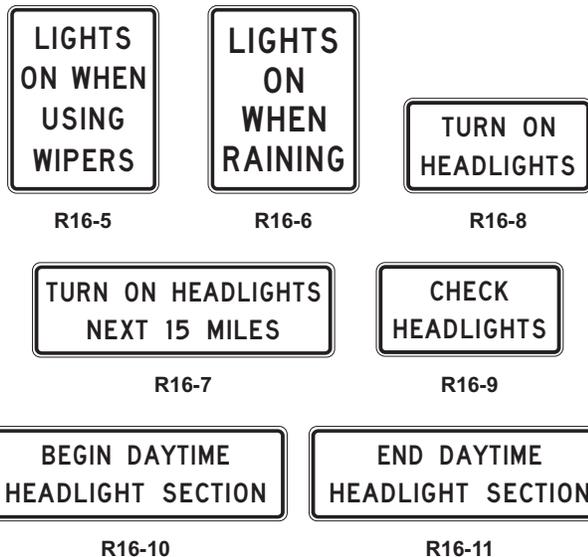
When a National Network route is signed, the National Network (R14-4) sign shall be used.

OPTION:

The National Network Prohibition (R14-5) sign may be used to identify routes, portions of routes, and ramps where

trucks are prohibited. The R14-5 sign may also be used to mark the ends of designated routes.

2B.64 Headlight Use Signs (R16-5 through R16-11)



SUPPORT:

Some States require road users to turn on their vehicle headlights under certain weather conditions, as a safety improvement measure on roadways experiencing high crash rates, or in special situations such as when driving through a tunnel.

OPTION:

A LIGHTS ON WHEN USING WIPERS (R16-5) sign or a LIGHTS ON WHEN RAINING (R16-6) sign may be installed to inform road users of State laws regarding headlight use. Although these signs are typically installed facing traffic entering the State just inside the State border, they also may be installed at other locations within the State.

GUIDANCE:

If a particular section of roadway has been designated as a safety improvement zone within which headlight use is required, a TURN ON HEADLIGHTS NEXT XX MILES (R16-7) sign or a BEGIN DAYTIME HEADLIGHT SECTION (R16-10) sign should be installed at the upstream end of the section, and a END DAYTIME HEADLIGHT SECTION (R16-11) sign should be installed at the downstream end of the section.

OPTION:

A TURN ON HEADLIGHTS (R16-8) sign may be installed to require road users to turn on their headlights in special situations such as when driving through a tunnel. A CHECK HEADLIGHTS (R16-9) sign may be installed downstream from the special situation to inform drivers that the using their headlights is no longer required.

2B.65 FENDER BENDER Sign (R16-4)

OPTION:

A FENDER BENDER MOVE VEHICLES FROM TRAVEL LANES (R16-4) sign may be installed to require motorists to move their vehicle out of the travel lanes if they have been involved in a crash.



R16-4



Seat Belt Symbol

2B.66 Seat Belt Symbol

STANDARD:

When a seat belt symbol is used, the symbol shown above shall be used.

GUIDANCE:

The seat belt symbol should not be used alone. If used, the seat belt symbol should be incorporated into regulatory sign messages for mandatory seat belt use.

2B.66.1 Other Regulatory Signs



R16-X6



R16-X10



R16-X12



R16-X13



R16-X33



R16-X40

OPTION:

Regulatory word message signs other than those shown in this Manual, the MnDOT "Standard Signs Manual", and the Federal "Standard Highways Sign and Markings" book may be developed to aid the enforcement of other laws or regulations.

GUIDANCE:

The Seat Belts Fastened sign (R16-X12) should be used wherever it is determined that the need exists to remind motorists to fasten their seat belts.

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At locations where the cross street does not have a name, the W14-1a or W14-2a signs may be used alone in place of a street name sign.

STANDARD:

The DEAD END (W14-1a) and NO OUTLET (W14-2a) signs shall be horizontal rectangles with an arrow pointing to the left or right.

When the W14-1 or W14-2 sign is used, the sign shall be posted as near as practical to the entry point or at a sufficient advance distance to permit the road user to avoid the dead end or no outlet condition by turning at the nearest intersecting street.

The DEAD END (W14-1a) or NO OUTLET (W14-2a) signs shall not be used instead of the W14-1 or W14-2 signs where traffic can proceed straight through the intersection into the dead end street or no outlet area.

2C.27 Low Clearance Signs (W12-2, W12-2a, W12-X2)



W12-2



W12-2a

STANDARD:

The Low Clearance (W12-2) sign shall be used to warn road users of clearances less than 12 inches above the statutory maximum vehicle height.

GUIDANCE:

The actual clearance should be displayed on the Low Clearance sign to the nearest 1 inch not exceeding the actual clearance. However, in areas that experience changes in temperature causing frost action, a reduction, not exceeding 3 inches, should be used for this condition.

Where the clearance is less than the legal maximum vehicle height, the W12-2 sign with a supplemental distance plaque should be placed at the nearest intersecting road or wide point in the road at which a vehicle can detour or turn around.



W12-X2

STANDARD:

In the case of an arch or other structure under which the clearance varies greatly, the W12-X2 Vertical Clearance sign shall be installed on the structure with the appropriate vertical clearance specified. The arrow shall indicate the location of the height specified on the sign.

GUIDANCE:

Two or more signs should be used as necessary on the structure itself to give information as to the clearances over the entire roadway. Clearances should be evaluated periodically, particularly when resurfacing operations have occurred.

OPTION:

The Low Clearance sign should be installed on and in advance of the structure. If a sign is placed on the structure, it should be a rectangular shape (W12-2a) with the appropriate legend.

2C.28 BUMP and DIP Signs (W8-1, W8-1a, W8-1b, W8-2)



W8-1



W8-1a



W8-1b



W8-2

GUIDANCE:

BUMP (W8-1) and DIP (W8-2) signs should be used to give warning of a sharp rise or depression in the profile of the road.

OPTION:

These signs may be supplemented with an Advisory Speed plaque (see Section 2C.8) or a 45 Degree Supplemental Arrow plaque (W16-7XP).

STANDARD:

The DIP sign (W8-2) shall not be used at a short stretch of depressed alignment that might momentarily hide a vehicle.

GUIDANCE:

A short stretch of depressed alignment that might momentarily hide a vehicle should be treated as a no-passing zone when center line striping is provided on a two-lane or three-lane road (see Section 3B.2).

OPTION:

At severe bumps, a BUMP AHEAD (W8-1a) sign may be placed in advance of the bump location. An appropriate Distance plaque (see Section 2C.55) or Advisory Speed plaque (See Section 2C.8) may be placed below the warning sign.

In areas of multiple bumps, a BUMPS (W8-1b) sign may be placed in advance of the area. An appropriate Distance plaque (see Section 2C.55) may be placed below the warning sign.

2C.29 SPEED HUMP Sign (W17-1)



W17-1

GUIDANCE:

The SPEED HUMP (W17-1) sign should be used to give warning of a vertical deflection in the roadway that is designed to limit the speed of traffic.

If used, the SPEED HUMP sign should be supplemented by an Advisory Speed plaque (see Section 2C.8).

OPTION:

If a series of speed humps exists in close proximity, an Advisory Speed plaque may be eliminated on all but the first SPEED HUMP sign in the series.

The legend SPEED BUMP may be used instead of the legend SPEED HUMP on the W17-1 sign.

SUPPORT:

Speed humps generally provide more gradual vertical deflection than speed bumps. Speed bumps limit the speed

of traffic more severely than speed humps. Other forms of speed humps include speed tables and raised intersections. However, these differences in engineering terminology are not well known by the public, so for signing purposes these terms are interchangeable.

2C.30 PAVEMENT ENDS Sign (W8-3)



W8-3

GUIDANCE:

A PAVEMENT ENDS (W8-3) word message sign should be used where a paved surface changes to either a gravel treated surface or an earth road surface.

OPTION:

An Advisory Speed plaque (see Section 2C.8) may be used when the change in roadway condition requires a reduced speed.

2C.31 Shoulder Signs (W8-4, W8-9, W8-17, W8-23, W8-25, W5-X1)



W8-4



W8-9



W8-25



W5-X1



W8-17

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OPTION:

PARK - RIDE signs may contain the local transit pictograph and/or carpool symbol on the sign.

STANDARD:

If used, the local transit pictograph and/or carpool symbol shall be located in the top part of the sign above the message PARK - RIDE. In no case shall the vertical dimension of the local transit pictograph and/or carpool symbol exceed 18 inches.

GUIDANCE:

If the function of the parking facility is to provide parking for persons using public transportation, the local transit pictograph should be used on the guide sign. If the function of the parking facility is to serve carpool riders, the carpool symbol should be used on the guide sign. If the parking facility serves both functions, both the pictograph and carpool symbol should be used.

STANDARD:

These signs shall have a retroreflective white legend and border on a rectangular green background. The carpool symbol shall be as shown for the D4-2 sign. The color of the local transit pictograph shall be selected by the local transit authority.

OPTION:

To increase the target value and contrast of the local transit pictograph, and to allow the local transit pictograph to retain its distinctive color and shape, the pictograph may be included within a white border or placed on a white background.

2D.49 Weigh Station Signing (D8 Series)

SUPPORT:

The general concept for Weigh Station signing is similar to Rest Area signing (see Section 2I.05) because in both cases traffic using either area remains within the right-of-way.

STANDARD:

The standard installation for Weigh Station signing shall include three basic signs:

- A. Advance sign (D8-1);
- B. Exit Direction sign (D8-2), and
- C. Gore sign (D8-3).

SUPPORT:

Example locations of these signs are shown in Figure 2D-17.

OPTION:

Where State law requires a regulatory sign (R13-X1) in advance of the Weigh Station, a fourth sign (see Section 2B.60) may be located following the Advance sign.

GUIDANCE:

The Exit Direction sign (D8-2) or the Advance sign (D8-1) should display, either within the sign border or on a supplemental plaque or sign panel, the changeable message OPEN or CLOSED.

2D.50 Community Wayfinding Signs

SUPPORT:

Community wayfinding guide signs are part of a coordinated and continuous system of signs that direct tourists and other road users to key civic, cultural, visitor, and recreational attractions and other destinations within a city or a local urbanized or downtown area.

Community wayfinding guide signs are a type of destination guide sign for conventional roads with a common color and/or identification enhancement marker for destinations within an overall wayfinding guide sign plan for an area.

Figures 2D-18 through 2D-20 illustrate various examples of the design and application of community wayfinding guide signs.

STANDARD:

The use of community wayfinding guide signs shall be limited to conventional roads. Community wayfinding guide signs shall not be installed on freeway or expressway mainlines or ramps. Direction to community wayfinding destinations from a freeway or expressway shall be limited to the use of a Supplemental Guide sign (see Section 2E.35) on the mainline and a Destination sign (see Section 2D.37) on the ramp to direct road users to the area or areas within which community wayfinding guide signs are used. The individual wayfinding destinations shall not be displayed on the Supplemental Guide and Destination signs except where the destinations are in accordance with the State or agency policy on Supplemental Guide signs.

Community wayfinding guide signs shall not be used to provide direction to primary destinations or highway routes or streets. Destination or other guide signs shall be used for this purpose as described elsewhere in this Chapter and shall have priority over any community wayfinding sign in placement, prominence, and conspicuity.

Because regulatory, warning, and other guide signs have a higher priority, community wayfinding guide signs shall not be installed where adequate spacing cannot be provided

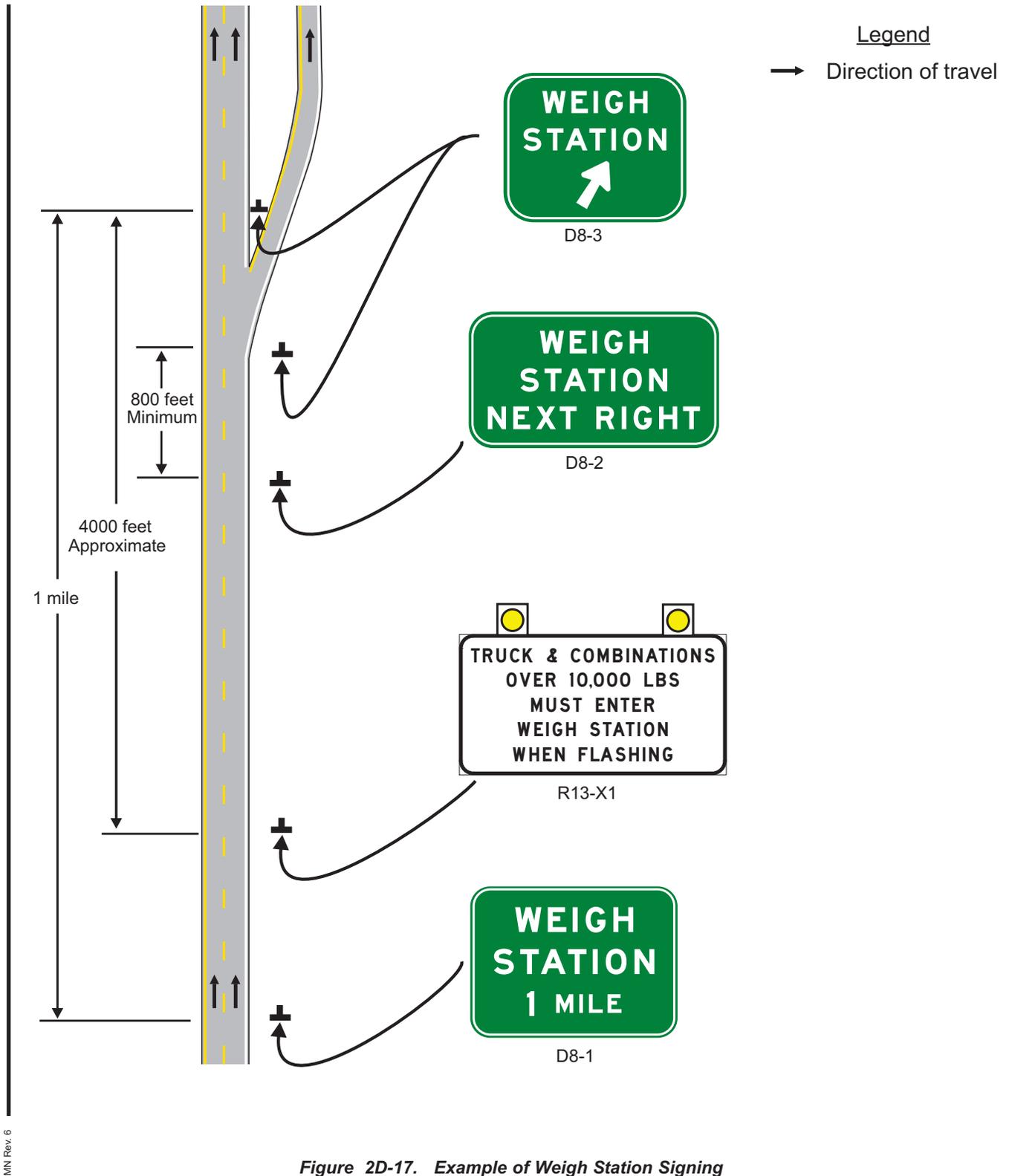


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GUIDANCE:

Memorial or dedication signs should have a white legend and border on a brown background.

STANDARD:

Where such memorial or dedication signs are installed on the mainline, (1) memorial or dedication names shall not appear on directional guide signs, (2) memorial or dedication signs shall not interfere with the placement of any other necessary signing, and (3) memorial or dedication signs shall not compromise the safety or efficiency of traffic flow. The memorial or dedication signing shall be limited to one sign at an appropriate location in each route direction, each as an independent sign installation.

Memorial or dedication signs shall be rectangular in shape. The legend displayed on memorial or dedication signs shall be limited to the name of the person or entity being recognized and a simple message preceding or following the name, such as "Dedicated to" or "Memorial Parkway." Additional legend, such as biographical information, shall not be displayed on memorial or dedication signs. Decorative or graphical elements, pictographs, logos, or symbols shall not be displayed on memorial or dedication signs. All letters and numerals displayed on memorial or dedication signs shall be as provided in the Federal "Standard Highway Signs and Markings" book (see Section 1A.11). The route number or officially mapped name of the highway shall not be displayed on the memorial or dedication sign.

Memorial or dedication names shall not appear on supplemental signs or on any other information sign on or along the highway or its intersecting routes.

OPTION:

The lettering for the name of the person or entity being recognized may be composed of a combination of lower-case letters with initial upper-case letters.

GUIDANCE:

Freeways and expressways should not be signed as memorial or dedicated highways.

SUPPORT:

Named highways are officially designated and shown on official maps and serve the purpose of providing route guidance, primarily on unnumbered highways. A highway designated as a memorial or dedication is not considered to be a named highway. Section 2D.53 contains provisions for the signing of named highways.

2M.10.1 Recreational or Cultural Interest Guide Signs and Symbol Signs on One Structure.

OPTION:

Symbol signs may be installed below a recreational or cultural interest area advance guide sign located on conventional highways and expressways.

STANDARD:

Symbol signs shall not be installed on freeways.

GUIDANCE:

Advance guide signs are normally installed 1/2 mi in advance of the access road to the recreational or cultural interest area.

OPTION:

Up to four 24 x 24 inch symbol sign panels may be installed horizontally beneath each recreational or cultural interest area guide sign (see Figure 2M-11).

GUIDANCE:

For structural and aesthetic reasons, the cumulative overall length of these symbol sign panels should not exceed the length of the recreational or cultural interest area sign.

STANDARD:

Sign panels installed beneath recreational or cultural interest area guide signs shall match those shown in Figure 2M-7. Symbol signs not illustrated on Figure 2M-12 shall be mutually agreed upon by MnDOT, MN DNR, and the FHWA.

When symbol sign panels are installed below an existing recreational or cultural interest area sign panel, the sign structure shall meet the requirements of the MnDOT Traffic Engineering Manual.

In order to provide the proper sign structure design, the existing sign structure shall be modified or replaced with the correct structure. The entire structure shall meet all of the pertinent mounting height requirements as shown in Figure 2M-3. Vertical heights shall be measured to the bottom of the symbol sign panels.

OPTION:

Seasonal changes of symbol sign panels may occur when they are mutually agreed upon by the local road authority and the requesting agency. The road authority's personnel will be responsible for changing, storing and reinstalling the symbol sign panels on the sign structure. This work may be delegated to the requesting agency's on-site staff.

STANDARD:

All signing costs for the fabrication and installation of the symbol sign panels, as well as all sign structure modification or replacement costs, shall be paid by the requesting agency.

2M.11 Resort Information Signs

2M.11.1 Purpose

SUPPORT:

Resort Information signs (Slat Signs) are addressed in Minnesota Statutes 160.283 through 160.285.

STANDARD:

For the specific purpose of this sign program, and as defined by these statutes, a "resort" shall be as defined in section 157.15 or a golf course, restaurant, or motel as defined in section 157.15 or recreational camping area as defined in section 327.14, subdivision 8.. The purpose of Resort Information signs is to provide identification and directional information to resorts for motorists after they have turned off from a trunk highway onto a local road.

2M.11.2 Application

STANDARD:

Resort Information signs shall be used only on "those county state-aid highways, county highways, and town roads within one-half mile of areas that have restrictions on the erection of advertising devices along or adjacent thereto imposed under the applicable provisions of Chapter 173 (Minnesota Statute 173).

They shall not be installed on any MnDOT maintained trunk highway, expressway, freeway, or interstate.

2M.11.3 General Design


STANDARD:

Each Resort Information sign shall be rectangular in shape having a white legend on a green background. The sign has no border. Logos or symbols of any kind shall not be used on the sign.

The legend on each Resort Information sign shall be limited to the name of the resort, golf course, motel, restaurant, or recreational camping area. The legends shall not include promotional advertising.

The legend shall be reflectorized, whereas the background may be reflectorized or nonreflectorized. However, reflectorized and nonreflectorized sign panels shall not be intermixed on an assembly.

2M.11.4 Style and Size of Lettering

STANDARD:

The standard lettering and letter spacing for the Resort Information signs shall be 4 inch upper case letters following the spacing dimensions specified in the "Minnesota Standard Signs Manual." (available from Map & Manual Sales Unit, page ii). The legend shall be centered on the sign.

2M.11.5 Size and Arrangement

STANDARD:

Each Slat Sign shall be 48" x 6".

The topmost sign or trailblazer sign of the Resort Information sign assembly shall be 48" x 12" and contain the word "RESORTS" along with one arrow to show which direction the motorist must travel to reach the resorts on the signs below. There shall be only one trailblazer sign on each assembly.

Each sign structure shall be capable of supporting one trailblazer sign and not more than five Resort Information signs placed beneath each other. (see Figure 2M-11)

The Resort Information signs shall be arranged alphabetically reading from top to bottom.

2M.11.6 Sign Locations

STANDARD:

The Resort Information sign assembly shall be located at least 500 feet from the nearest interstate highway ramp and at least 300 feet from any intersection. The assembly shall not obstruct the driver's view of other traffic control devices. They shall be placed at least 200 feet apart and at least 300 feet from other traffic control devices.

OPTION:

The sign assemblies may be located laterally outside the normal longitudinal alignment of other traffic control signs, but within the right-of-way.

STANDARD:

The location of other traffic control devices shall at all times take precedence over the location of Resort Information signs.

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 per cent of the cost of the signs as per MN Statute 160.285, subd. 1.



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

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information regarding the spacing of raised pavement markers on longitudinal markings.

3B.12 Raised Pavement Markers as Vehicle Positioning Guides with Other Longitudinal Markings

OPTION:

Retroreflective or internally illuminated raised pavement markers may be used as positioning guides with longitudinal line markings without necessarily conveying information to the road user about passing or lane-use restrictions. In such applications, markers may be positioned in line with or immediately adjacent to a single line marking, or positioned between the two lines of a double center line or double lane line marking.

GUIDANCE:

The spacing for such applications should be $2N$, where N equals the length of one line segment plus one gap (see Section 3B.11).

OPTION:

Where it is desired to alert the road user to changes in the travel path, such as on sharp curves or on transitions that reduce the number of lanes or that shift traffic laterally, the spacing may be reduced to N or less.

On freeways and expressways, a spacing of $3N$ may be used for relatively straight and level roadway segments where engineering judgment indicates that such spacing will provide adequate delineation under wet night conditions.

3B.13 Raised Pavement Markers Supplementing Other Markings

GUIDANCE:

The use of retroreflective or internally illuminated raised pavement markers for supplementing longitudinal line markings should comply with the following:

A. Lateral Positioning

1. When supplementing double line markings, pairs of raised pavement markers placed laterally in line with or immediately outside of the two lines should be used.
2. When supplementing wide line markings, pairs of raised pavement markers placed laterally adjacent to each other should be used.

B. Longitudinal Spacing

1. When supplementing solid line markings, raised pavement markers at a spacing no greater than N (see Section 3B.11) should be used, except when supplementing left edge line markings, a spacing no greater than $N/2$ should be used.

2. When supplementing broken line markings, a spacing no greater than $3N$ should be used. However, when supplementing broken line markings identifying reversible lanes, a spacing no greater than N should be used.
3. When supplementing dotted line markings, a spacing appropriate for the application should be used.
4. When supplementing longitudinal line markings through at-grade intersections, one raised pavement marker for each short line segment should be used.
5. When supplementing edge line extensions through freeway interchanges, a spacing of no greater than N should be used.

Raised pavement markers should not supplement right-hand edge lines unless an engineering study or engineering judgment indicates the benefits of enhanced delineation of a curve or other location would outweigh possible impacts on bicycles using the shoulder, and the spacing of raised pavement markers on the right-hand edge is close enough to avoid misinterpretation as a broken line during wet night conditions.

OPTION:

Raised pavement markers also may be used to supplement other markings such as channelizing islands, gore areas, approaches to obstructions, or wrong-way arrows.

To improve the visibility of horizontal curves, center lines may be supplemented with retroreflective or internally illuminated raised pavement markers for the entire curved section as well as for a distance in advance of the curve that approximates 5 seconds of travel time..

3B.14 Raised Pavement Markers Substituting for Pavement Markings

OPTION:

Retroreflective or internally illuminated raised pavement markers, or nonretroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may be substituted for markings of other types.

GUIDANCE:

If used, the pattern and color of the raised pavement markers should simulate the pattern and color of the markings for which they substitute.

OPTION:

The side of a raised pavement marker that is visible to traffic proceeding in the wrong direction may be red.

STANDARD:

If raised pavement markers are used to substitute for broken line markings, a group of three to five markers equally spaced at a distance no greater than N/8 (see Section 3B.11) shall be used. If N is other than 40 feet, the markers shall be equally spaced over the line segment length (at 1/2 points for three markers, at 1/3 points for four markers, and at 1/4 points for five markers). At least one retroreflective or internally illuminated marker per group shall be used or a retroreflective or internally illuminated marker shall be installed midway in each gap between successive groups of non retroreflective markers.

When raised pavement markers substitute for solid line markings, the markers shall be equally spaced at no greater than N/4, with retroreflective or internally illuminated units at a spacing no greater than N/2.

GUIDANCE:

Raised pavement markers should not substitute for right-hand edge line markings unless an engineering study or engineering judgment indicates the benefits of enhanced delineation of a curve or other location would outweigh possible impacts on bicycles using the shoulder, and the spacing of raised pavement markers on the right-hand edge line is close enough to avoid misinterpretation as a broken line during wet night conditions.

STANDARD:

When raised pavement markers substitute for dotted lines, they shall be spaced at no greater than N/4, with not less than one raised pavement marker per dotted line segment. At least one raised marker every N shall be retroreflective or internally illuminated.

OPTION:

When substituting for wide lines, raised pavement markers may be placed laterally adjacent to each other to simulate the width of the line.

3B.15 Transverse Markings

STANDARD:

Transverse markings, which include shoulder markings, word and symbol markings, arrows, stop lines, yield lines, crosswalk lines, speed measurement markings, speed reduction markings, speed hump markings, parking space markings, and others, shall be white unless otherwise provided in this Manual.

GUIDANCE:

Because of the low approach angle at which pavement markings are viewed, transverse lines should be proportioned to provide visibility equal to that of longitudinal lines.

3B.16 Stop and Yield Lines

GUIDANCE:

Stop lines should be used to indicate the point behind which vehicles are required to stop in compliance with a traffic control signal.

OPTION:

A stop line may be omitted on an approach to a traffic control signal if a crosswalk line of at least 24 inches in width is in place for that approach.

Stop lines may be omitted prior to Freeway Entrance Ramp Control Signals.

Stop lines may be used to indicate the point behind which vehicles are required to stop in compliance with a STOP (R1-1) sign, a Stop Here For Pedestrians (R1-5b or R1-5c) sign, or some other traffic control device that requires vehicles to stop, except YIELD signs that are not associated with passive grade crossings.

Yield lines may be used to indicate the point behind which vehicles are required to yield in compliance with a YIELD (R1-2) sign.

STANDARD:

Except as provided in Section 8B.28, stop lines shall not be used at locations where drivers are required to yield in compliance with a YIELD (R1-2) sign.

Yield lines shall not be used at locations where drivers are required to stop in compliance with a STOP (R1-1) sign, a Stop Here For Pedestrians (R1-5b or R1-5c) sign, a traffic control signal, or some other traffic control device.

Stop lines shall consist of solid white lines extending across approach lanes to indicate the point at which the stop is intended or required to be made.

Yield lines (see Figure 3B-16) shall consist of a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is intended or required to be made.

GUIDANCE:

Stop lines should be 12 to 24 inches wide.

The individual triangles comprising the yield line should have a base of 12 to 24 inches wide and a height equal to 1.5 times the base. The space between the triangles should be 3 to 12 inches.

If used, stop and yield lines should be placed a minimum of 4 feet in advance of the nearest crosswalk line at controlled intersections, except for yield lines at roundabouts as provided for in Section 3C.4 and at midblock crosswalks. In the absence of a marked crosswalk, the stop line or yield line should be placed at the desired stopping or yielding point, but should not be placed more than 30 feet or less than 4 feet from the nearest edge of the intersecting traveled way.

GUIDANCE:

When used for lane reduction transitions, the delineators should be used adjacent to the lane or lanes reduced for the full length of the transition and should be so placed and spaced to show the reduction (see Figure 3B-14).

SUPPORT:

Delineators are not necessary for traffic moving in the direction of a wider pavement or on the side of the roadway where the alignment is not affected by the lane reduction transition.

GUIDANCE:

On a highway with continuous delineation on either or both sides, delineators should be carried through transitions.

OPTION:

On a highway with continuous delineation on either or both sides, the spacing between a series of delineators may be closer.

STANDARD:

When used on a truck escape ramp, delineators shall be red.

GUIDANCE:

Red delineators should be placed on both sides of truck escape ramps. The delineators should be spaced at 50-foot intervals for a distance sufficient to identify the ramp entrance. Delineator spacing beyond the ramp entrance should be adequate for guidance according to the length and design of the escape ramp.

3F.4 Delineator Placement and Spacing

GUIDANCE:

Delineators should be mounted on suitable supports at a mounting height, measured vertically from the bottom of the lowest retroreflective device to the elevation of the near edge of the roadway, of approximately 4 feet.

OPTION:

When mounted on the face of or on top of guardrails or other longitudinal barriers, delineators may be mounted at a lower elevation than the normal delineator height recommended in the previous Guidance paragraph.

GUIDANCE:

Delineators should be placed 2 to 8 feet outside the outer edge of the shoulder, or if appropriate, in line with the roadside barrier that is 8 feet or less outside the outer edge of the shoulder.

Delineators should be placed at a constant distance from the edge of the roadway, except that where an obstruction

intrudes into the space between the pavement edge and the extension of the line of the delineators, the delineators should be transitioned to be in line with or inside the innermost edge of the obstruction. If the obstruction is a guardrail, the delineators should be transitioned to be either just behind, directly above (in line with), or on the innermost edge of the guardrail or longitudinal barrier.

Delineators should be spaced 200 to 530 feet apart on mainline tangent sections. Delineators should be spaced 100 feet apart on ramp tangent sections.

SUPPORT:

Examples of delineator installations are shown in Figure 3F-1.

OPTION:

When uniform spacing is interrupted by such features as driveways and intersections, delineators which would ordinarily be located within the features may be relocated in either direction for a distance not exceeding one quarter of the uniform spacing. Delineators still falling within such features may be eliminated.

Delineators may be transitioned in advance of a lane transition or obstruction as a guide for oncoming traffic.

GUIDANCE:

The spacing of delineators should be adjusted on approaches to and throughout horizontal curves so that several delineators are always simultaneously visible to the road user. The approximate spacing shown in Table 3F-1 should be used.

OPTION:

When needed for special conditions, delineators of the appropriate color may be mounted in a closely-spaced manner on the face of or on top of guardrails or other longitudinal barriers to form a continuous or nearly continuous "ribbon" of delineation.

3F.4.1 Intersection Delineator

OPTION:

Delineators may be used to guide motorists through unlit or poorly lit intersections.

STANDARD:

If used, delineators shall be of the same color as the corresponding edge line.

SUPPORT:

Several methods of delineating intersections have been used. One which provides guidance to all motorists regardless of their direction of approach to an intersection is a cylindrical or near cylindrical design.

Radius (R) of Curve feet	Approximate Spacing (S) on Curve feet
50	20
115	25
180	35
250	40
300	50
400	55
500	65
600	70
700	75
800	80
900	85
1,000	90

- Notes:
1. Spacing for specific radii may be interpolated from table.
 2. The minimum spacing should be 20 feet.
 3. The spacing on curves should not exceed 300 feet.
 4. In advance of or beyond a curve, and proceeding away from the end of the curve, the spacing of the first delineator is 2S, the second 3S, and the third 6S, but not to exceed 300 feet.
 5. S refers to the delineator spacing for specific radii computed from the formula $S = 3\sqrt{R-50}$
 6. The distances for S shown in the table above were rounded to the nearest 5 feet.

**Table 3F-1 Approximate Spacing for Delineators
on Horizontal Curves**

One such design is based on a single 6 or 8 inch diameter tube, 9 to 12 inches tall. The tube should have a black background or be painted black and have two 3-inch white retroreflective bands of applied 3 inches apart. (see Figure 3F-2)

When mounted such that the post is inside of the tube, it will provide delineation equally in all directions.

GUDANCE:

When used, at least one delineator of this type should be used in each corner of an intersection. (see Figure 3F-2).

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PART 4. HIGHWAY TRAFFIC SIGNALS

Chapter 4D. Traffic Control Signal Features

4D.1 General

SUPPORT:

The features of traffic control signals of interest to road users are the location, design, and meaning of the signal indications. Uniformity in the design features that affect the traffic to be controlled, as set forth in this Manual, is especially important for the safety and efficiency of operations.

Traffic control signals can be operated in pretimed, semi-actuated, or full-actuated modes. For isolated (non-interconnected) signalized locations on rural high-speed highways, full-actuated mode with advance vehicle detection on the high-speed approaches is typically used. These features are designed to reduce the frequency with which the onset of the yellow change interval is displayed when high-speed approaching vehicles are in the "dilemma zone" such that the drivers of these high-speed vehicles find it difficult to decide whether to stop or proceed.

STANDARD:

When a traffic control signal is not in operation, such as before it is placed in service, during seasonal shutdowns, or when it is not desirable to operate the traffic control signal, the signal faces shall be covered, turned, or taken down to clearly indicate that the traffic control signal is not in operation.

SUPPORT:

Seasonal shutdown is a condition in which a permanent traffic signal is turned off or otherwise made non-operational during a particular season when its operation is not justified. This might be applied in a community where tourist traffic during most of the year justifies the permanent signalization, but a seasonal shutdown of the signal during an annual period of lower tourist traffic would reduce delays; or where a major traffic generator, such as a large factory, justifies the permanent signalization, but the large factory is shut down for an annual factory vacation for a few weeks in the summer.

STANDARD:

A traffic control signal shall control traffic only at the intersection or mid-block location where the signal faces are placed.

Mid-block crosswalks shall not be signalized if they are located within 300 feet from the nearest traffic control signal, unless the proposed traffic control signal will not restrict the progressive movement of traffic.

GUIDANCE:

A midblock crosswalk location should not be controlled by a traffic control signal if the crosswalk is located within 100 feet from side streets or driveways that are controlled by STOP signs or YIELD signs.

Engineering judgment should be used to determine the proper phasing and timing for a traffic control signal. Since traffic flows and patterns change, phasing and timing should be reevaluated regularly and updated if needed.

Traffic control signals within 1/2 mile of one another along a major route or in a network of intersecting major routes should be coordinated, preferably with interconnected controller units. Where traffic control signals that are within 1/2 mile of one another along a major route have a jurisdictional boundary or a boundary between different signal systems between them, coordination across the boundary should be considered.

SUPPORT:

Signal coordination need not be maintained between control sections that operate on different cycle lengths.

For coordination with grade crossing signals and movable bridge signals, see Sections 4D.27, 4J.3, 8C.9, and 8C.10.

4D.2 Responsibility for Operation and Maintenance

GUIDANCE:

Prior to installing any traffic control signal, the responsibility for the maintenance of the signal and all of the appurtenances, hardware, software, and the timing plan(s) should be clearly established. The responsible agency should provide for the maintenance of the traffic control signal and all of its appurtenances in a competent manner.

To this end the agency should:

- A. Keep every controller assembly in effective operation in accordance with its predetermined timing schedule; check the operation of the controller assembly frequently enough to verify that it is operating in accordance with the predetermined timing schedule; and establish a policy to maintain a record of all timing changes and that only authorized persons are permitted to make timing changes;
- B. Clean the optical system of the signal sections and replace the light sources as frequently as experience proves necessary;

- C. Clean and service equipment and other appurtenances as frequently as experience proves necessary;
- D. Provide for alternate operation of the traffic control signal during a period of failure, using flashing mode or manual control, or manual traffic direction by proper authorities as might be required by traffic volumes or congestion, or by erecting other traffic control devices;
- E. Have properly skilled maintenance personnel available without undue delay for all signal malfunctions and signal indication failures;
- F. Provide spare equipment to minimize the interruption of traffic control signal operation as a result of equipment failure;
- G. Provide for the availability of properly skilled maintenance personnel for the repair of all components; and
- H. Maintain the appearance of the signal displays and equipment.

4D.3 Provisions for Pedestrians

SUPPORT:

Chapter 4E contains additional information regarding pedestrian signals and Chapter 4F contains additional information regarding pedestrian hybrid beacons.

STANDARD:

The design and operation of traffic control signals shall take into consideration the needs of pedestrian as well as vehicular traffic.

If engineering judgment indicates the need for provisions for a given pedestrian movement, signal faces conveniently visible to pedestrians shall be provided by pedestrian signal heads (see Chapter 4E) or a vehicular signal face(s) for a concurrent vehicular movement.

GUIDANCE:

Accessible pedestrian signals (see Sections 4E.9 through 4E.13) that provide information in non-visual format (such as audible tones, speech messages, and/or vibrating surfaces) should be provided where determined appropriate by engineering judgment.

Where pedestrian movements regularly occur, pedestrians should be provided with sufficient time to cross the roadway by adjusting the traffic control signal operation and timing to provide sufficient crossing time every cycle or by providing pedestrian detectors.

If it is necessary or desirable to prohibit certain pedestrian movements at a traffic control signal location, No Pedestrian Crossing (R9-3) signs (see Section 2B.51) should be used. A barrier or other physical feature to physically prevent the

pedestrian movements should be considered in lieu of, or in addition to, signs.

4D.4 Meaning of Vehicular Signal Indications

SUPPORT:

The "Uniform Vehicle Code" (see Section 1A.11) is the primary source for the standards for the meaning of vehicular signal indications to both vehicle operators and pedestrians as provided in this Section, and the standards for the meaning of separate pedestrian signal head indications as provided in Section 4E.2.

The physical area that is defined as being "within the intersection" is dependent upon the conditions that are described in the definition of intersection in Section 1A.13.

STANDARD:

Unless otherwise determined by law, the following meanings shall be given to highway traffic signal indications for vehicles and pedestrians:

A. Steady green signal indications shall have the following meanings:

1. Vehicular traffic facing a CIRCULAR GREEN signal indication is permitted to proceed straight through or turn right or left or make a U-turn movement except as such movement is modified by lane-use signs, turn prohibition signs, lane markings, roadway design, separate turn signal indications, or other traffic control devices.

Such vehicular traffic, including vehicles turning right or left or making a U-turn movement, shall yield the right-of-way to:

- (a) Pedestrians lawfully within an associated crosswalk, and
- (b) Other vehicles lawfully within the intersection.

In addition, vehicular traffic turning left or making a U-turn movement to the left shall yield the right-of-way to other vehicles approaching from the opposite direction so closely as to constitute an immediate hazard during the time when such turning vehicle is moving across or within the intersection.

2. Vehicular traffic facing a GREEN ARROW signal indication, displayed alone or in combination with another signal indication, is permitted to cautiously enter the intersection only to make the movement indicated by such arrow, or such other movement as is permitted by other signal indications displayed at the same time.

PART 4. HIGHWAY TRAFFIC SIGNALS

Chapter 4I. Traffic Control Signals for Freeway Entrance Ramps

4I.1 Application of Freeway Entrance Ramp Control Signals

SUPPORT:

Ramp control signals are traffic control signals that control the flow of traffic entering the freeway facility. This is often referred to as "ramp metering"

Freeway entrance ramp control signals are sometimes used if controlling traffic entering the freeway could reduce the total expected delay to traffic in the freeway corridor, including freeway ramps and local streets

GUIDANCE:

The installation of ramp control signals should be preceded by an engineering study of the physical and traffic conditions on the highway facilities likely to be affected. The study should include the ramps and ramp connections and the surface streets that would be affected by the ramp control, as well as the freeway section concerned.

SUPPORT:

Information on conditions that might justify freeway entrance ramp control signals, factors to be evaluated in traffic engineering studies for ramp control signals, design of ramp control signals, and operation of ramp control signals can be found in the FHWA's "Ramp Management and Control Handbook" (see Section 1A.11).

4I.2 Design of Freeway Entrance Ramp Control Signals

STANDARD:

Ramp control signals shall meet all of the standard design specifications for traffic control signals, except as otherwise provided in this Section.

The signal face for freeway entrance ramp control signals shall be either a two section signal face containing red and green signal indications or a three section signal face containing red, yellow, and green signal indications.

If only one lane is present on an entrance ramp or if more than one lane is present on an entrance ramp and the ramp control signals are operated such that green signal indications are always displayed simultaneously to all of the lanes on the ramp, then a minimum of two signal faces per ramp shall face entering traffic.

If multiple lanes are present on an entrance ramp and the

ramp control faces are operated such that green signal indications are not always displayed simultaneously to all of the lanes on the ramp, then:

- A. If there are two separately-controlled lanes, a minimum of two signal faces shall be provided for each of the two lanes, with both mounted at the side of the roadway on a single pole (see Option below), or a combination thereof.
- B. If there are three or more separately-controlled lanes, one signal face shall be provided over the approximate center of each separately-controlled lane.

GUIDANCE:

Additional side-mounted signal faces should be considered for ramps with three or more separately-controlled lanes.

STANDARD:

Ramp control signals shall be located and designed to minimize their viewing by mainline freeway traffic.

GUIDANCE:

Ramp control signals should be located at the point where it is intended for traffic to stop.

OPTION:

Vehicle clearance intervals shorter than 3 seconds may be used.

Ramp control signal faces may be less than 8 feet apart measured horizontally between centers of faces.

OPTION:

Ramp control signals may be placed in the dark mode (no indications displayed) when not in use.

Ramp control signals may be used to control some, but not all, lanes on a ramp, such as when non-metered HOV bypass lanes are provided on a ramp.

The required signal faces, if located at the side of the ramp roadway, may be mounted such that the height above the pavement grade at the center of the ramp roadway to the bottom of the signal housing of the lowest signal face is between 4.5 feet and 6 feet.

For entrance ramps with only one controlled lane, the two required signal faces may both be mounted at the side of the roadway on a single pole, with one face at the normal

mounting height and one face mounted lower as provided in the previous paragraph, as a specific exception to the normal 8-foot minimum lateral separation of signal faces required by Section 4D.13.

GUIDANCE:

Regulatory signs with legends appropriate to the control, such as XX Vehicle (S) Per Green or XX VEHICLE(S) PER GREEN Each Lane (see Section 2B.56), should be installed adjacent to the ramp control signal faces. When ramp control signals are installed on a freeway-to-freeway ramp, special consideration should be given to assuring adequate visibility of the ramp control signals, and multiple advance warning signs with flashing warning beacons should be installed to warn road users of the metered operation.

4I.3 Operation of Freeway Entrance Ramp Control Signals

GUIDANCE:

Operational strategies for ramp control signals, such as periods of operation, metering rates and algorithms, and queue management, should be determined by the operating agency prior to the installation of the ramp control signals and should be closely monitored and adjusted as needed thereafter.

When the ramp control signals are operated only during certain periods of the day and sight distance is insufficient to react to stopped vehicles, a RAMP METERED WHEN FLASHING (W3-8) sign (see Section 2C.37) should be installed in advance of the ramp control signal near the entrance to the ramp, or on the arterial on the approach to the ramp, to alert road users to the presence and operation of ramp meters.

STANDARD:

The RAMP METERED WHEN FLASHING sign shall be supplemented with a warning beacon (see Section 4L.3) that flashes when the ramp control signal is in operation.

PART 5. TRAFFIC CONTROL DEVICES FOR LOW VOLUME ROADS

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PART 5. TRAFFIC CONTROL DEVICES FOR LOW VOLUME ROADS

Chapter 5G. Temporary Traffic Control Zones

5G.1 Introduction

GUIDANCE:

The safety of road users, including pedestrians and bicyclists, as well as personnel in work zones, should be an integral and high priority element of every project in the planning, design, maintenance, and construction phases.

Part 6 should be reviewed for additional criteria, specific details, and more complex temporary traffic control zone requirements.

The following principles should be applied to temporary traffic control zones:

- A. Traffic movement should be disrupted as little as possible.
- B. Road users should be guided in a clear and positive manner while approaching and within construction, maintenance, and utility work areas.
- C. Routine inspection and maintenance of traffic control elements should be performed both day and night.
- D. Both the contracting agency and the contractor should assign at least one person on each project to have day-to-day responsibility for assuring that the traffic control elements are operating effectively and that any needed operational changes are brought to the attention of their supervisors.

Traffic control in temporary traffic control zones should be designed on the assumption that road users will only reduce their speeds if they clearly perceive a need to do so, and then only in small increments of speed. Temporary traffic control zones should not present a surprise to the road user. Frequent and/or abrupt changes in geometrics and other features should be avoided. Transitions should be well delineated and long enough to accommodate driving conditions at the speeds vehicles are realistically expected to travel.

A temporary traffic control plan (see Section 6C.1) should be used for a temporary traffic control zone on a low-volume road to specify particular traffic control devices and features, or to reference typical drawings such as those contained in Part 6.

SUPPORT:

Applications of speed reduction countermeasures and enforcement can be effective in reducing traffic speeds in temporary traffic control zones.

5G.2 Applications

GUIDANCE:

Planned work phasing and sequencing should be the basis for the use of traffic control devices for temporary traffic control zones. Part 6 should be consulted for specific traffic control requirements and examples where construction or maintenance work is planned.

SUPPORT:

Maintenance activities might not require extensive temporary traffic control if the traffic volumes and speeds are low.

OPTION:

The traffic applications shown in Part 6, Section 6K - Minnesota Temporary Traffic Control Field Manual, especially the Low-Volume area are among those that may be used on low-volume roads.

SUPPORT:

Traffic can regulate itself when traffic volumes are low and the length of the work space is short, thus enabling drivers to readily see the roadway beyond the work space. If the drivers cannot see beyond the work space or traffic volumes do not allow passage thru the work space, then a flagger should be used.

OPTION:

For low-volume roadways with speeds of 30 miles per hour or less, a minimum distance of 100 feet may be used for the advance placement distance and the distance between signs shown in the typical applications.

For temporary traffic control zones on low-volume roads that require flaggers, a single flagger may be adequate if the flagger is visible to approaching traffic from all appropriate directions.

5G.3 Channelization Devices

STANDARD:

Channelization devices for nighttime use shall have the same retroreflective requirements as specified for higher-volume roadways.

OPTION:

To alert, guide and direct road users through temporary traffic control zones on low-volume roads, tapers may be used to move a road user out of the traffic lane and around the work space using the spacing of devices that is described in Section 6F.63.

5G.4 Markings

GUIDANCE:

Pavement markings should be considered for temporary traffic control zones on paved low-volume roads, especially roads that had existing pavement markings, or that have a surfaced detour or temporary roadway.

OPTION:

Interim pavement markings may be omitted in a temporary traffic control zone if they are not needed based on the criteria for these markings in Section 6F.78.

5G.5 Other Traffic Control Devices

STANDARD:

Other traffic control devices, such as other signs, signals, and illumination that are used on low volume roads in temporary traffic control zones, but are not described in Part 5, shall comply with the provisions contained in other Parts of this Manual.

SUPPORT:

Some of the signs that might be applicable in a temporary traffic control zone on a low-volume road are shown in Chapter 6F.

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7D. Crossing Supervision

7D.1 Types of Crossing Supervision

SUPPORT:

There are three types of school crossing supervision:

- A. Adult control of pedestrians and vehicles by adult crossing guards,
- B. Adult control of pedestrians and vehicles by uniformed law enforcement officers, and
- C. Student and/or parent control of only pedestrians with student and/or parent patrols.

Information regarding the organization, administration and operation of a school safety patrol program is contained in “AAA School Safety Patrol Operations Manual” (see Section 1A.11).

7D.2 Adult Crossing Guards

OPTION:

Adult crossing guards may be used to provide gaps in traffic at school crossings where an engineering study has shown that adequate gaps must be created (See Section 7A-3) and where authorized by law.

Adult crossing guards may act as a school bus flagger (see Section 7F).

7D.3 Qualifications of Adult Crossing Guards

SUPPORT:

High standards for selection of adult crossing guards are essential because they are responsible for the safety of and the efficient crossing of the street by schoolchildren within and in the immediate vicinity of school crosswalks.

GUIDANCE:

Adult crossing guards should possess the following minimum qualifications:

- A. Average intelligence;
- B. Good physical condition, including sight, hearing, and ability to move and maneuver quickly in order to avoid danger from errant vehicles;
- C. Ability to control a STOP paddle effectively to provide approaching road users with a clear, fully direct view of the paddle's STOP message during the entire crossing movement;
- D. Ability to communicate specific instructions clearly, firmly, and courteously;
- E. Ability to recognize potentially dangerous traffic situations and warn and manage students in sufficient time to avoid injury;
- F. Mental alertness;

- G. Neat appearance;
- H. Good character;
- I. Dependability;
- J. An overall sense of responsibility for the safety of students; and
- K. Completion of an official training program.

7D.4 Uniform of Adult Crossing Guards

STANDARD:

Law enforcement officers performing school crossing supervision and adult crossing guards shall wear high-visibility retroreflective safety apparel labeled as ANSI 107-2004 standard performance for Class 2 as described in Section 6E.2.

Compliance Date: December 31, 2011

7D.5 Operating Procedures for Adult Crossing Guards

STANDARD:

Adult crossing guards shall not direct traffic in the usual law enforcement regulatory sense. In the control of traffic, they shall pick opportune times to create a sufficient gap in the traffic flow. At these times, they shall stand in the roadway to indicate that pedestrians are about to use or are using the crosswalk, and that all vehicular traffic must stop.

Adult crossing guards shall use a STOP paddle. The STOP paddle shall be the primary hand-signaling device.

The STOP (R1-1) paddle shall be an octagonal shape. The background of the STOP face shall be red with at least 6-inch series upper-case white letters and border. The paddle shall be at least 18 inches in size and have the word message STOP on both sides. The paddle shall be retroreflectorized or illuminated when used during hours of darkness.

OPTION:

The STOP paddle may be modified to improve conspicuity by incorporating white or red flashing lights on both sides of the paddle. Among the types of flashing lights that may be used are individual LEDs or groups of LEDs.

The white or red flashing lights or LEDs may be arranged in any of the following patterns:

- A. Two white or red lights centered vertically above and below the STOP legend,
- B. Two white or red lights centered horizontally on each side of the STOP legend,
- C. One white or red light centered below the STOP legend,
- D. A series of eight or more small white or red lights having a diameter of 1/4 inch or less along the outer edge of the paddle, arranged in an octagonal pattern at the eight corners of the STOP paddle (more than eight lights may be used only if the arrangement of the lights is such that it clearly conveys the octagonal shape of the STOP paddle), 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 paddle, the flash rate shall be at least 50, but no more than 60, flash periods per minute.

Part 7. TRAFFIC CONTROLS FOR SCHOOL AREAS

7F. School Bus Flagger

7F.1 Operating Procedures for Adult School Bus Flaggers

OPTION:

Adult school bus flaggers may be utilized to control buses and vehicular traffic at school entrances and exits to allow buses to enter or exit a street or highway having a speed limit of 35 miles per hour or less as per MN Statute 169.06 Subd. 4.

STANDARD:

Adult school bus flaggers shall follow the same procedures and equipment standards as in Section 7D.

GUIDANCE:

A Multi-lane roadway should utilize additional school bus flaggers.

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

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Chapter 8C.

**FLASHING LIGHT SIGNALS, GATES,
AND TRAFFIC CONTROL SIGNALS**

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

Chapter 8A. General

8A.1 Introduction

SUPPORT:

Whenever the acronym "LRT" is used in Part 8, it refers to "light rail transit." Part 8 describes the traffic control devices that are used at highway-rail and highway-LRT grade crossings. Unless otherwise provided in the text or on a figure or table, the provisions of Part 8 are applicable to both highway-rail and highway-LRT grade crossings. When the phrase "grade crossing" is used by itself without the prefix "highway-rail" or "highway-LRT," it refers to both highway-rail and highway-LRT grade crossings.

Traffic control for grade crossings includes all signs, signals, markings, other warning devices, and their supports along highways approaching and at grade crossings. The function of this traffic control is to promote safety and provide effective operation of rail and/or LRT and highway traffic at grade crossings.

For purposes of design, installation, operation, and maintenance of traffic control devices at grade crossings, it is recognized that the crossing of the highway and rail tracks is situated on a right-of-way available for the joint use of both highway traffic and railroad or LRT traffic.

The highway agency or authority with jurisdiction and the regulatory agency with statutory authority, if applicable, jointly determine the need and selection of devices at a grade crossing.

In Part 8, the combination of devices selected or installed at a specific grade crossing is referred to as a "traffic control system."

STANDARD:

The traffic control devices, systems, and practices described in this Manual shall be used at all grade crossings open to public travel, consistent with Federal, State, and local laws and regulations.

SUPPORT:

Part 8 also describes the traffic control devices that are used in locations where light rail LRT vehicles are operating along streets and highways in mixed traffic with automotive vehicles.

LRT is a mode of metropolitan transportation that employs LRT vehicles (commonly known as light rail vehicles, streetcars, or trolleys) that operate on rails in

streets in mixed traffic, and LRT traffic that operates in semi-exclusive rights-of-way, or in exclusive rights-of-way. Grade crossings with LRT can occur at intersections or at midblock locations, including public and private driveways.

An initial educational campaign along with an ongoing program to continue to educate new drivers is beneficial when introducing LRT operations to an area and, hence, new traffic control devices.

LRT alignments can be grouped into one of the following three types:

- A. Exclusive: An LRT right-of-way that is grade-separated or protected by a fence or traffic barrier. Motor vehicles, pedestrians, and bicycles are prohibited within the right-of-way. Subways and aerial structures are included within this group. This type of alignment does not have grade crossings and is not further addressed in Part 8.
- B. Semi-exclusive: An LRT alignment that is in a separate right-of-way or along a street or railroad right-of-way where motor vehicles, pedestrians, and bicycles have limited access and cross at designated locations only.
- C. Mixed-use: An alignment where LRT operates in mixed traffic with all types of road users. This includes streets, transit malls, and pedestrian malls where the right-of-way is shared.

STANDARD:

Where LRT and railroads use the same tracks or adjacent tracks, the traffic control devices, systems, and practices for highway-rail grade crossings shall be used.

SUPPORT:

To promote an understanding of common terminology between highway, railroad and LRT signaling issues, definitions and acronyms pertaining to Part 8 are provided in Sections 1A.13 and 1A.14.

8A.2 Use of Standard Devices, Systems, and Practices at Highway-Rail Grade Crossings

SUPPORT:

Because of the large number of significant variables to be considered, no single standard system of traffic control devices is universally applicable for all highway-rail grade crossings.

GUIDANCE:

The appropriate traffic control system to be used at a highway-rail grade crossing should be determined by an engineering study involving both the highway agency and the railroad company.

OPTION:

The engineering study may include the Highway-Rail Intersection (HRI) components of the National Intelligent Transportation Systems (ITS) architecture, which is a USDOT accepted method for linking the highway, vehicles, and traffic management systems with rail operations and wayside equipment.

SUPPORT:

More detail on HRI components is available from USDOT's Federal Railroad Administration, 1200 New Jersey Avenue, SE, Washington, DC 20590 or www.fra.dot.gov.

STANDARD:

Traffic control devices, systems, and practices shall be consistent with the design and application of the Standards contained in this Manual.

Before a new highway-rail grade crossing traffic control system is installed or before modifications are made to an existing system, approval shall be obtained from the highway agency with the jurisdictional and/or statutory authority, and from the railroad company.

GUIDANCE:

To stimulate effective responses from road users, these devices, systems, and practices should use the five basic considerations employed generally for traffic control devices and described fully in Section 1A.2: design, placement, operation, maintenance, and uniformity.

SUPPORT:

Many other details of highway-rail grade crossing traffic control systems that are not set forth in Part 8 are contained in the publications listed in Section 1A.11, including the "2000 AREMA Communications & Signals Manual" published by the American Railway Engineering & Maintenance-of-Way Association (AREMA) and the 2006 edition of "Preemption of Traffic Signals Near Railroad Crossings" published by the Institute of Transportation Engineers (ITE).

8A.3 Use of Standard Devices, Systems, and Practices at Highway-LRT Grade Crossings

SUPPORT:

The combination of devices selected or installed at a specific highway-LRT grade crossing is referred to as a Light Rail Transit Traffic Control System.

Because of the large number of significant variables to be considered, no single standard system of traffic control devices is universally applicable for all highway-LRT grade crossings.

For the safety and integrity of operations by highway and LRT users, the highway agency with jurisdiction, the regulatory agency with statutory authority, if applicable, and the LRT authority jointly determine the need and selection of traffic control devices and the assignment of priority to LRT at a highway-LRT grade crossing.

The normal rules of the road and traffic control priority identified in the "Uniform Vehicle Code" govern the order assigned to the movement of vehicles at an intersection unless the local agency determines that it is appropriate to assign a higher priority to LRT. Examples of different types of LRT priority control include separate traffic control signal phases for LRT movements, restriction of movement of roadway vehicles in favor of LRT operations, and preemption of highway traffic signal control to accommodate LRT movements.

GUIDANCE:

The appropriate traffic control system to be used at a highway-LRT grade crossing should be determined by an engineering study conducted by the LRT or highway agency in cooperation with other appropriate State and local organizations.

STANDARD:

Traffic control devices, systems, and practices shall be consistent with the design and application of the Standards contained in this Manual.

The traffic control devices, systems, and practices described in this Manual shall be used at all highway-LRT grade crossings.

Before any new highway-LRT grade crossing traffic control system is installed or before modifications are made to an existing system, approval shall be obtained from the highway agency with the jurisdictional and/or statutory authority, and from the LRT agency.

8B.6.1 Supplemental Grade Crossing Advance Warning Signs (W10-X2, W10-X3)



W10-X2



W10-X3

STANDARD:

These signs shall be used in advance of non-signalized railroad crossings, where conditions indicate the need for additional advance warning supplementing that provided by the Highway-Rail Grade Crossing Advance Warning sign (W10-1). They shall always be preceded on the approach by the W10-1 sign.

GUIDANCE:

The use of these signs should be based on an investigation of pertinent conditions at the crossing, such as train and vehicle speeds, sight distance or obstructions, stopping distances and similar conditions.

SUPPORT:

The HIDDEN CROSSING sign (W10-X2) warns of sight obstructions at the crossing area calling for added vigilance on the part of the motorist.

The LOOK FOR TRAINS sign (W10-X3) is a supplemental sign used to warn the motorist of his obligation to determine whether or not it is safe for him to proceed over the crossing. It could logically follow the HIDDEN CROSSING sign for additional emphasis.

OPTION:

Appropriate advisory speed plates may be mounted beneath any railroad advance warning sign to indicate the safe vehicle approach speed to the crossing.

8B.7 EXEMPT Grade Crossing Plaques (R15-3P, W10-1aP)



R15-3P



W10-1aP

OPTION:

When authorized by law or regulation, a supplemental EXEMPT (R15-3P) plaque with a white background may be used below the Crossbuck sign or Number of Tracks plaque, if present, at the grade crossing, and a supplemental EXEMPT (W10-1aP) plaque with a yellow background may be used below the Grade Crossing Advance Warning (W10 series) sign.

Where neither the Crossbuck sign nor the advance warning signs exist for a particular highway-LRT grade crossing, an EXEMPT (R15-3P) plaque with a white background may be placed on its own post on the near right-hand side of the approach to the crossing.

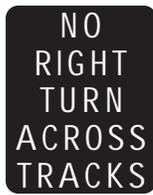
SUPPORT:

Minnesota Statute 169.28 states:

"The commissioner shall direct the railroad to erect at the crossing signs bearing the word "Exempt" that conform to section 169.06. The installation or presence of an exempt sign does not relieve a driver of the duty to use due care. A train must not proceed across an exempt crossing unless a police officer is present to direct traffic or a railroad employee is on the ground to warn traffic until the train enters the crossing."

These supplemental plaques inform drivers of highway vehicles carrying passengers for hire, school buses carrying students, or highway vehicles carrying hazardous materials that a stop is not required at certain designated grade crossings, except when rail traffic is approaching or occupying the grade crossing, or the driver's view is blocked.

8B.8 Turn Restrictions During Preemption



R3-1a



R3-2a

GUIDANCE:

At a signalized intersection that is located within 200 feet of a highway-rail grade crossing, measured from the edge of the track to the edge of the roadway, where the intersection traffic control signals are preempted by the approach of a train, all existing turning movements toward the highway-rail grade crossing should be prohibited during the signal preemption sequences.

OPTION:

A blank-out or changeable message sign and/or appropriate highway traffic signal indication or other similar type sign may be used to prohibit turning movements toward the highway-rail grade crossing during preemption. The R3-1a and R3-2a signs may be used for this purpose.

SUPPORT:

LRT operations can include the use of activated blank-out sign technology for turn prohibition signs. The signs are typically used on roads paralleling a semi exclusive or mixed-use LRT alignment where road users might turn across the LRT tracks. A blank-out sign displays its message only when activated. When not activated, the sign face is blank.

GUIDANCE:

An LRT-activated blank-out turn prohibition (R3-1a or R3-2a) sign should be used where an intersection adjacent to a highway-LRT crossing is controlled by STOP signs, or is controlled by traffic control signals with permissive turn movements for road users crossing the tracks.

OPTION:

An LRT-activated blank-out turn prohibition (R3-1a or R3-2a) sign may be used for turning movements that cross the tracks.

As an alternative to LRT-activated blank-out turn prohibition signs at intersections with traffic control signals, exclusive traffic control signal phases such that all movements that cross the tracks have a steady red indication may be used in combination with No Turn on Red (R10-11, R10-11a, or R10-11b) signs (see Section 2B.53).

STANDARD:

Turn prohibition signs that are associated with preemption shall be visible or activated only when the grade crossing restriction is in effect.

8B.9 DO NOT STOP ON TRACKS Sign (R8-8)



R8-8

GUIDANCE:

A DO NOT STOP ON TRACKS (R8-8) sign should be installed whenever an engineering study determines that the potential for highway vehicles stopping on the tracks at a grade crossing is significant. Placement of the R8-8 sign should be determined as part of the engineering study. The sign, if used, should be located on the right-hand side of the highway on either the near or far side of the grade crossing, depending upon which position provides better visibility to approaching drivers.

If a STOP or YIELD sign is installed at a location, including at a circular intersection, that is downstream from the grade crossing such that highway vehicle queues are likely to extend beyond the tracks, a DO NOT STOP ON TRACKS sign (R8-8) should be used.

OPTION:

DO NOT STOP ON TRACKS signs may be placed on both sides of the track.

On divided highways and one-way streets, a second DO NOT STOP ON TRACKS sign may be placed on the near or far left-hand side of the highway at the grade crossing to further improve visibility of the sign.

8B.28 Stop and Yield Lines

STANDARD:

On paved roadways at grade crossings that are equipped with active control devices such as flashing-light signals, gates, or traffic control signals, a stop line (see Section 3B.16) shall be installed to indicate the point behind which highway vehicles are or might be required to stop.

GUIDANCE:

On paved roadway approaches to passive grade crossings where a STOP sign is installed in conjunction with the Crossbuck sign, a stop line should be installed to indicate the point behind which highway vehicles are required to stop or as near to that point as practical.

If a stop line is used, it should be a transverse line at a right angle to the traveled way and should be placed approximately 8 feet in advance of the gate (if present), but no closer than 15 feet in advance of the nearest rail.

OPTION:

On paved roadway approaches to passive grade crossings where a YIELD sign is installed in conjunction with the

Crossbuck sign, a yield line (see Section 3B.16) or a stop line may be installed to indicate the point behind which highway vehicles are required to yield or stop or as near to that point as practical.

GUIDANCE:

If a yield line is used, it should be a transverse line (see Figure 3B-16) at a right angle to the traveled way and should be placed no closer than 15 feet in advance of the nearest rail (see Figure 8B-6).

8B.29 Dynamic Envelope Markings

SUPPORT:

The dynamic envelope (see Figures 8B-8 and 8B-9) markings indicate the clearance required for the train or LRT equipment overhang resulting from any combination of loading, lateral motion, or suspension failure.

OPTION:

Dynamic envelope markings may be installed at all grade crossings, unless a Four-Quadrant Gate system (see Section 8C.6) is used.

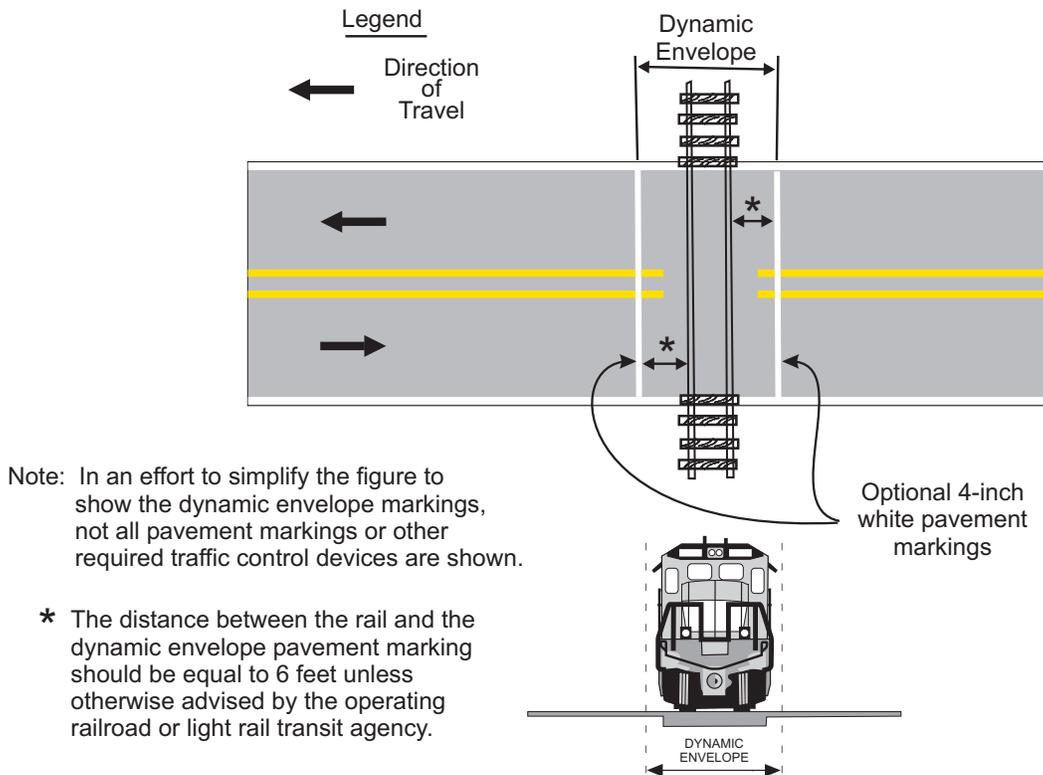


Figure 8B-8. Example of Dynamic Envelope Pavement Markings at Grade Crossings

STANDARD:

If used, pavement markings for indicating the dynamic envelope shall comply with the provisions of Part 3 and shall be a 4-inch normal solid white line or contrasting pavement color and/or contrasting pavement texture.

GUIDANCE:

If pavement markings are used to convey the dynamic envelope, they should be placed completely outside of the dynamic envelope. If used, dynamic envelope pavement markings should be placed on the highway 6 feet from and parallel to the nearest rail unless the operating railroad company or LRT agency advises otherwise. The pavement markings should extend across the roadway as shown in Figure 8B-8. The dynamic envelope pavement markings

should not be placed perpendicular to the roadway at skewed grade crossings.

OPTION:

In semi-exclusive LRT alignments, the dynamic envelope markings may be along the LRT trackway between intersections where the trackway is immediately adjacent to travel lanes and no physical barrier is present.

In mixed-use LRT alignments, the dynamic envelope markings may be continuous between intersections (see Figure 8B-9).

In mixed-use LRT alignments, pavement markings for adjacent travel or parking lanes may be used instead of dynamic envelope markings if the lines are outside the dynamic envelope.

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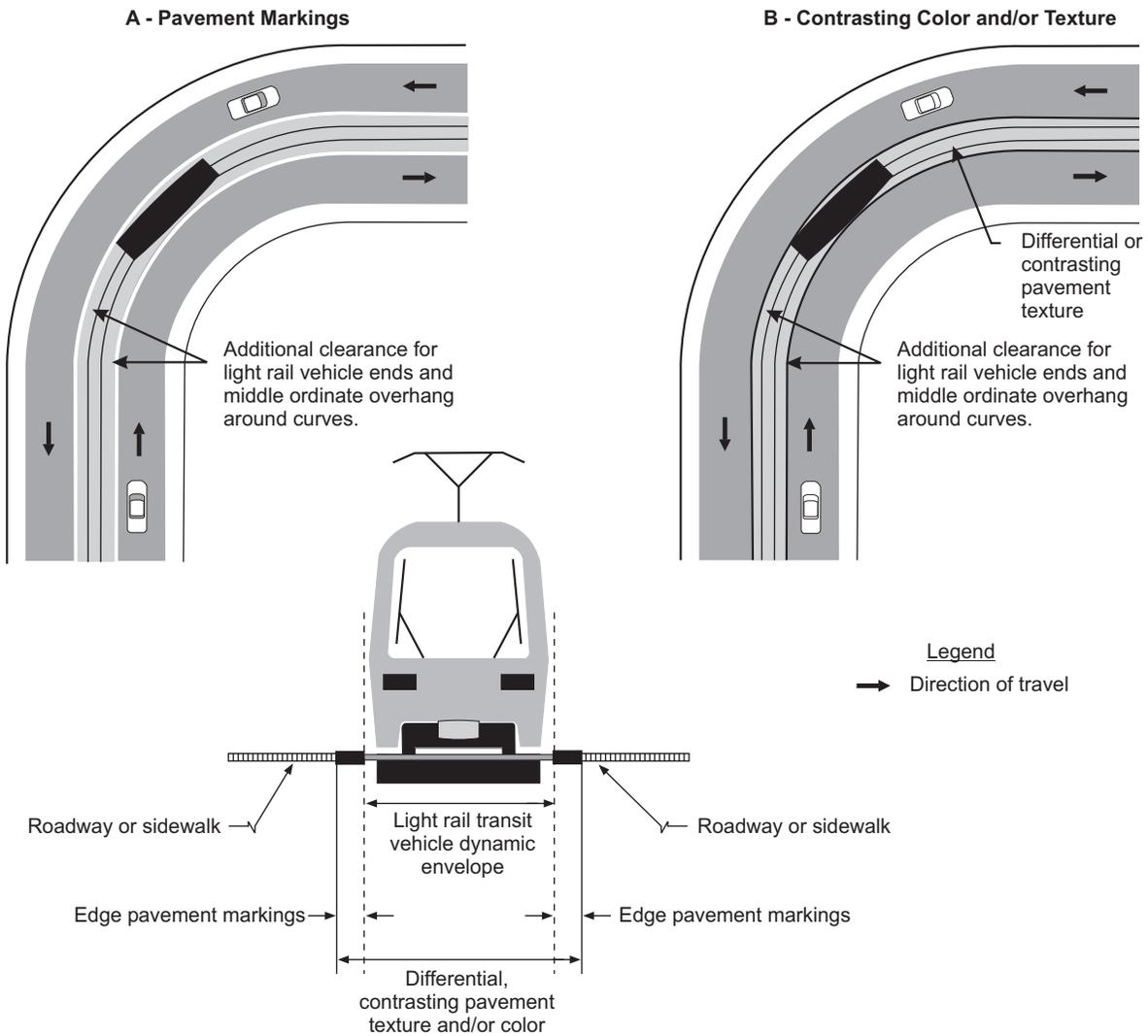


Figure 8B-9. Examples of Light Rail Transit Vehicle Dynamic Envelope Markings for Mixed-Use Alignments

	Three-Lens Signal	Two-Lens Signal
<p>SINGLE LRT ROUTE</p> 	<p>STOP </p> <p>PREPARE TO STOP  <i>Flashing</i></p> <p>GO </p>	<p>STOP </p> <p>GO  (2)</p>
<p>TWO LRT ROUTE DIVERSION</p> 	  <i>Flashing</i>   (1)	   (1), (2)
	  <i>Flashing</i>   (1)	   (1), (2)
<p>THREE LRT ROUTE DIVERSION</p> 	  <i>Flashing</i>    (1)	    (1), (2)

Notes:

All aspects are white.

(1) Could be in single housing.

(2) "Go" lens may be used in flashing mode to indicate "prepare to stop".

Figure 8C-3. Light Rail Transit Signals

8C.12 Grade Crossings Within or In Close Proximity to Circular Intersections

SUPPORT:

At circular intersections, such as roundabouts and traffic circles, that include or are within close proximity to a grade crossing, a queue of vehicular traffic could cause highway vehicles to stop on the grade crossing.

STANDARD:

Where circular intersections include or are within 200 feet of a grade crossing, an engineering study shall be made to determine if queuing could impact the grade crossing. If traffic queues impact the grade crossing, provisions shall be made to clear highway traffic from the grade crossing prior to the arrival of rail traffic.

SUPPORT:

Among the actions that can be taken to keep the grade crossing clear of traffic or to clear traffic from the grade crossing prior to the arrival of rail traffic are the following:

- A. Elimination of the circular intersection,
- B. Geometric design revisions,
- C. Grade crossing regulatory and warning devices,
- D. Highway traffic signals,
- E. Traffic metering devices,
- F. Activated signs, or
- G. A combination of these or other actions.

8C.13 Pedestrian and Bicycle Signals and Crossings at LRT Grade Crossings

GUIDANCE:

Where LRT tracks are immediately adjacent to other tracks or a road, pedestrian signalization should be designed to avoid having pedestrians wait between sets of tracks or between the tracks and the road. If adequate space exists for a pedestrian refuge and is justified based on engineering judgment, additional pedestrian signal heads, signing, and detectors should be installed (see Section 4E.8).

STANDARD:

When used at LRT crossings, pedestrian signal heads shall comply with the provisions of Section 4E.4.

GUIDANCE:

Flashing-light signals (see Figure 8C-4) with a Crossbuck (R15-1) sign and an audible device should be installed at pedestrian and bicycle crossings where an engineering study has determined that the sight distance is not sufficient for pedestrians and bicyclists to complete their crossing prior to the arrival of the LRT traffic at the crossing, or where LRT speeds exceed 35 mph.

If an engineering study shows that flashing-light signals with a Crossbuck sign and an audible device would not provide sufficient notice of an approaching LRT traffic, the LOOK (R15-8) sign (see Figure 8C-4) and/or pedestrian gates should be considered (see Figures 8C-5 through 8C-7).

SUPPORT:

A pedestrian gate is similar to an automatic gate except the gate arm is shorter.

The swing gate alerts pedestrians to the LRT tracks that are to be crossed. Swing gates are designed to open away from the tracks, requiring users to pull the gate open to cross, but permitting a quick exit from the trackway, and to automatically close.

OPTION:

Swing gates may be installed across pedestrian and bicycle walkways (see Figure 8C-8).

Pedestrian barriers at offset crossings may be used at pedestrian and bicycle crossings as passive devices that force users to face approaching LRT before entering the trackway (see Figures 8C-9 and 8C-10).

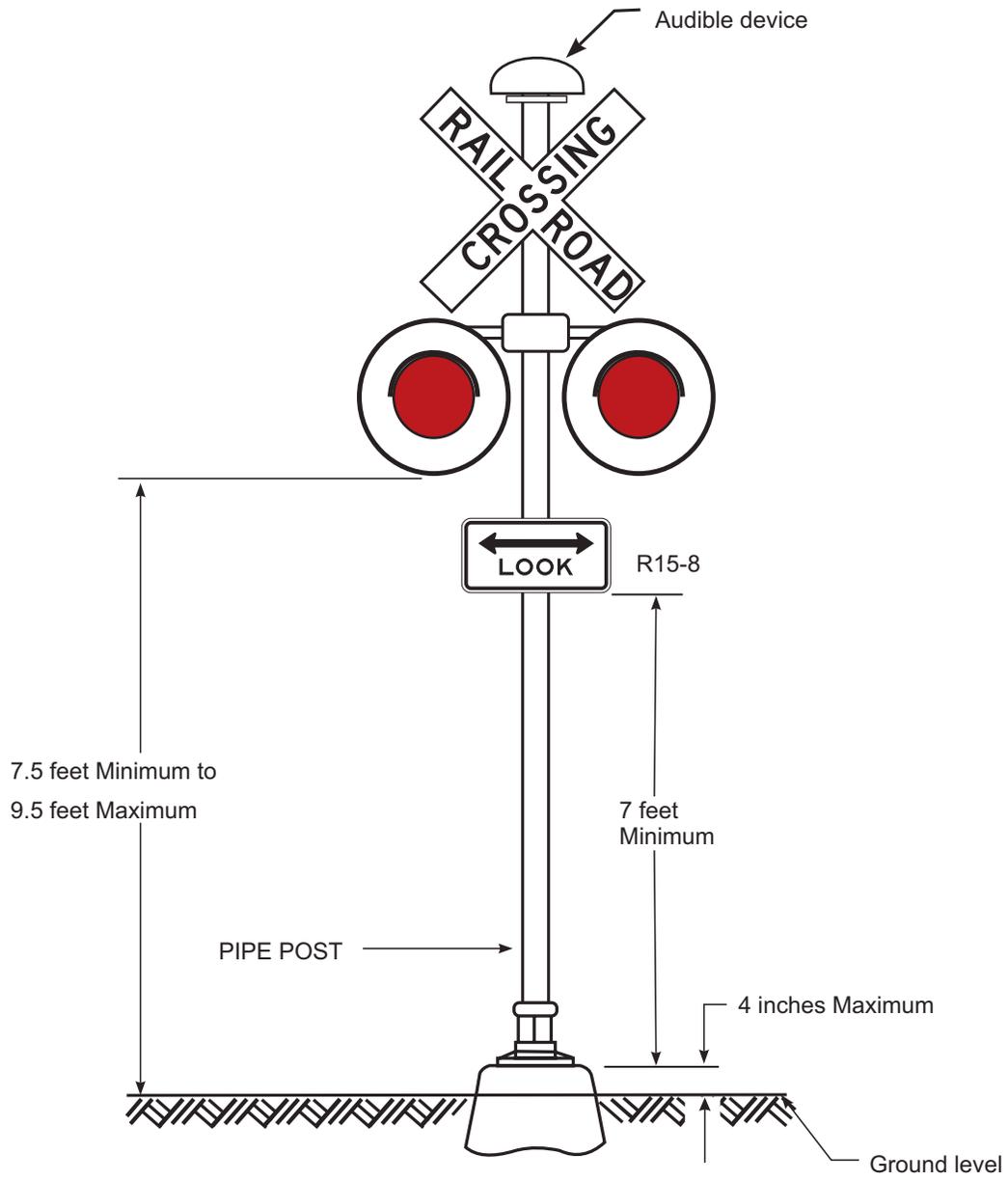


Figure 8C-4. Example of Flashing-Light Signal Assembly for Pedestrian Crossings.

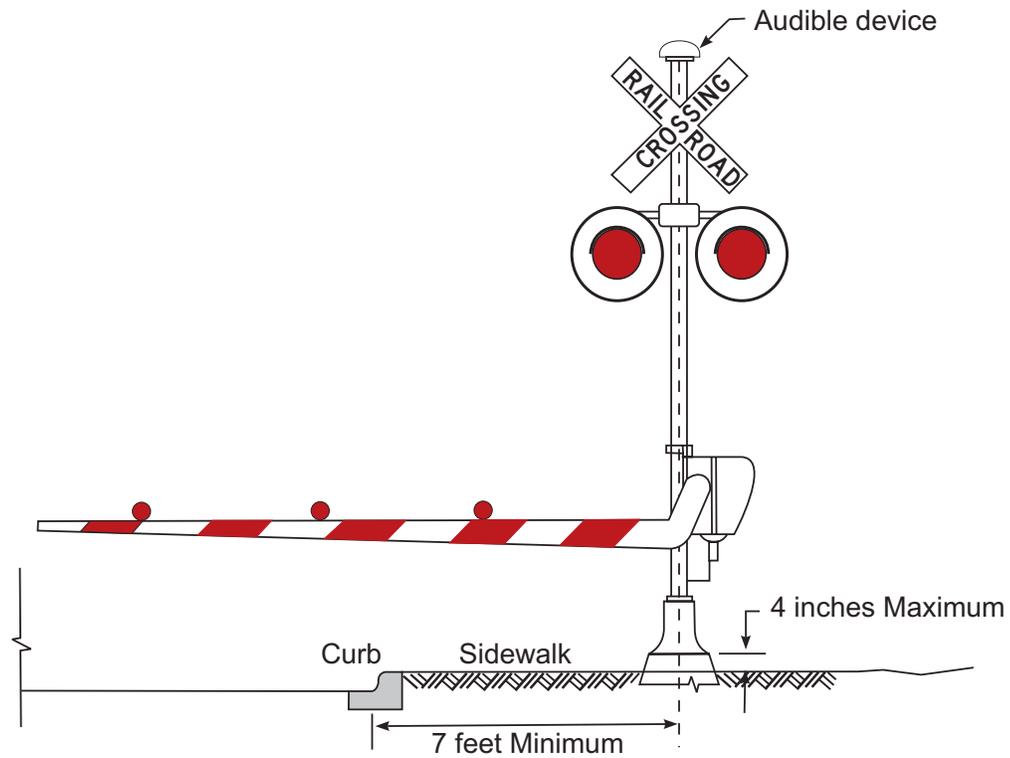


Figure 8C-5. Example of a Shared Pedestrian/Roadway Gate

Note: The provision of a separate pedestrian gate is optional based upon site-specific conditions. If a separate pedestrian gate is provided, the need for a separate Crossbuck sign, audible device, and flashing-light signals should be determined based upon site-specific conditions such as the proximity of the sidewalk or shared-use path to the roadway grade crossing devices.

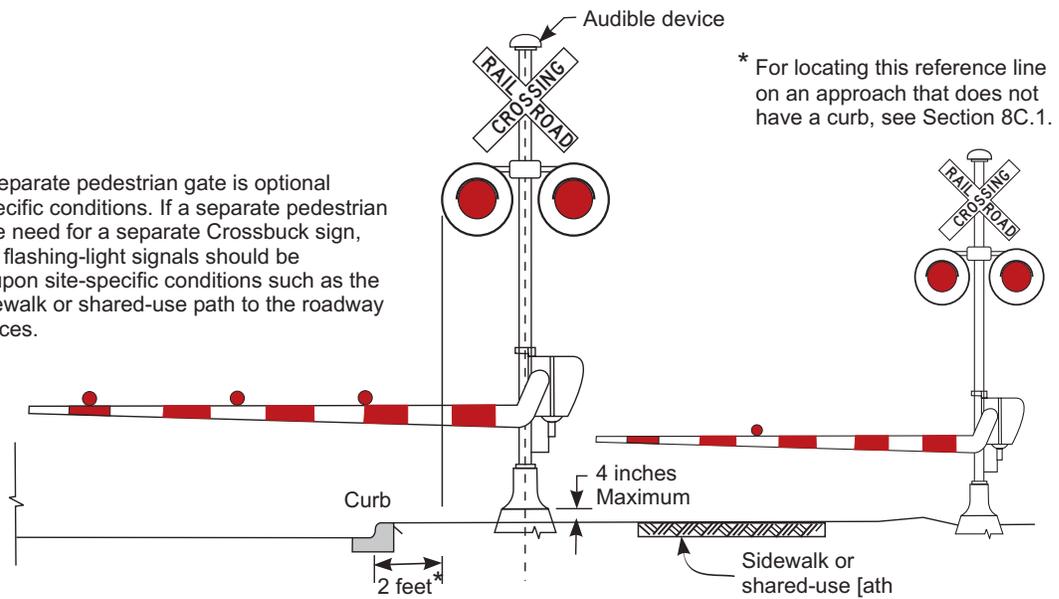
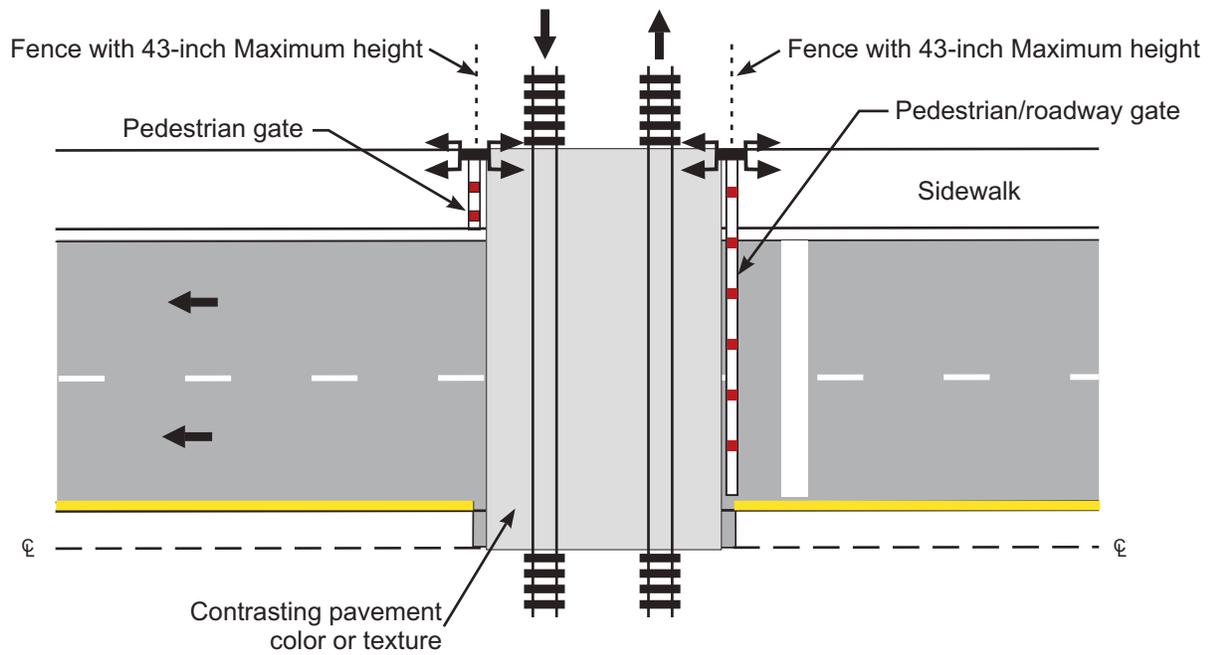


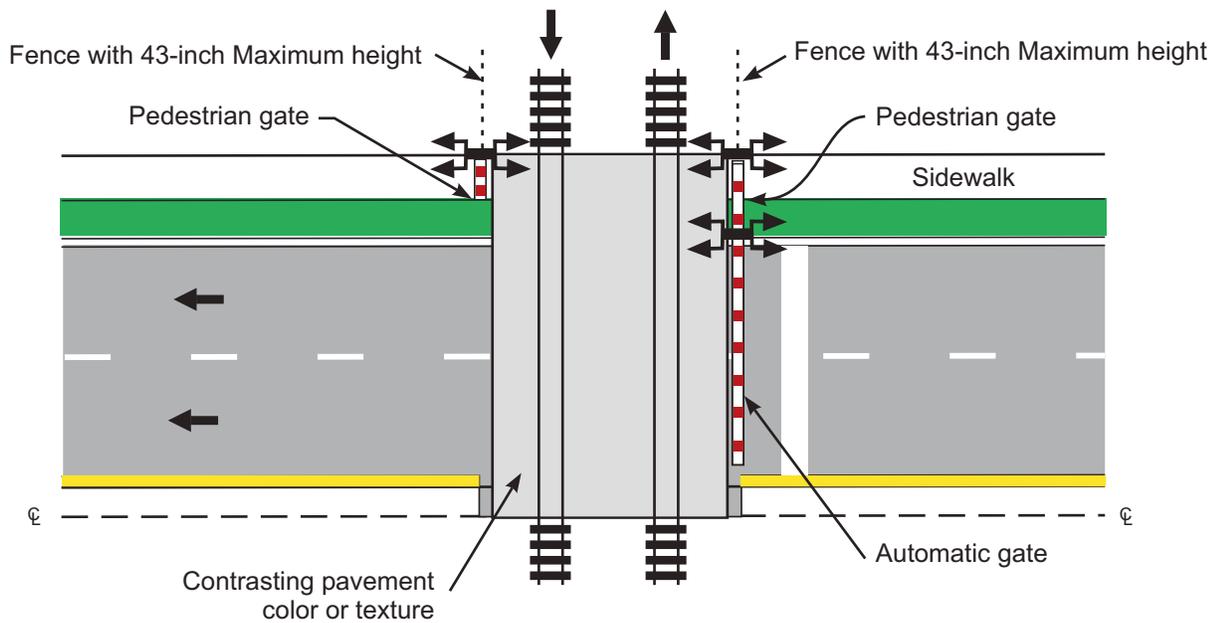
Figure 8C-6. Example of a Separate Pedestrian Gate



GATE SUPPORT BEHIND SIDEWALK

Legend

➔ Direction of travel



GATE SUPPORT BETWEEN SIDEWALK AND ROADWAY

Figure 8C-7. Examples of Placement of Pedestrian Gates

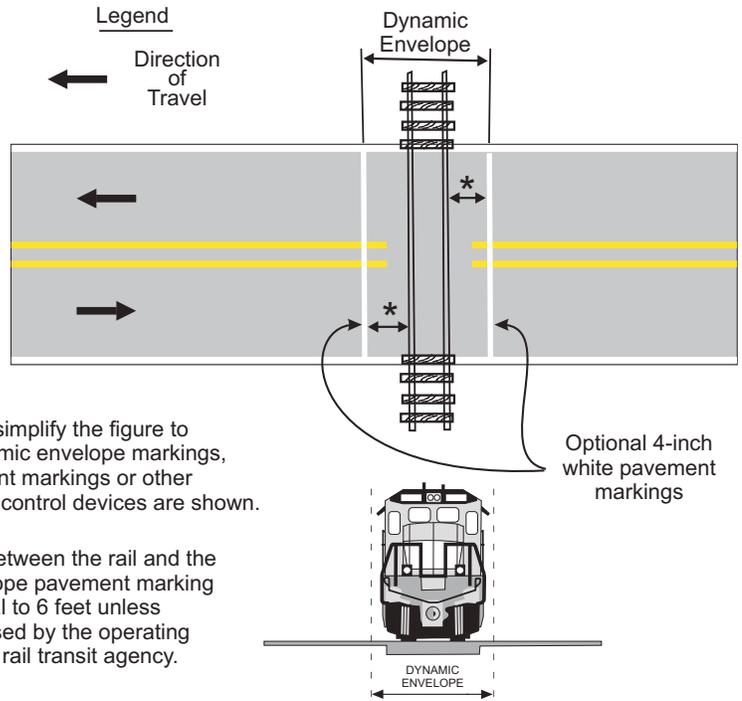


Figure 8C-8. Example of Dynamic Envelope Pavement Markings at Grade Crossings

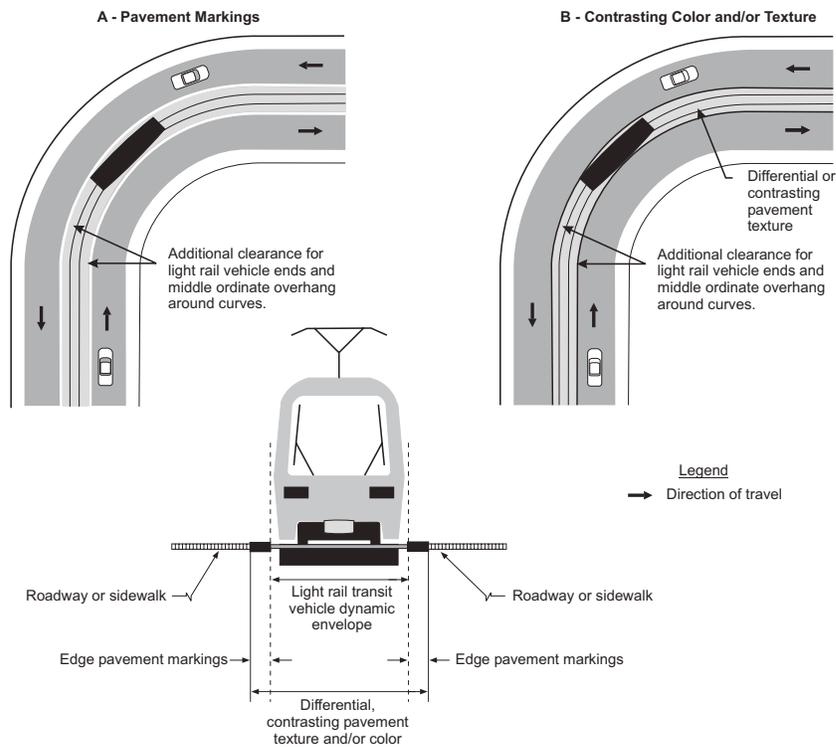


Figure 8C-9. Examples of Light Rail Transit Vehicle Dynamic Envelope Markings for Mixed-Use Alignments

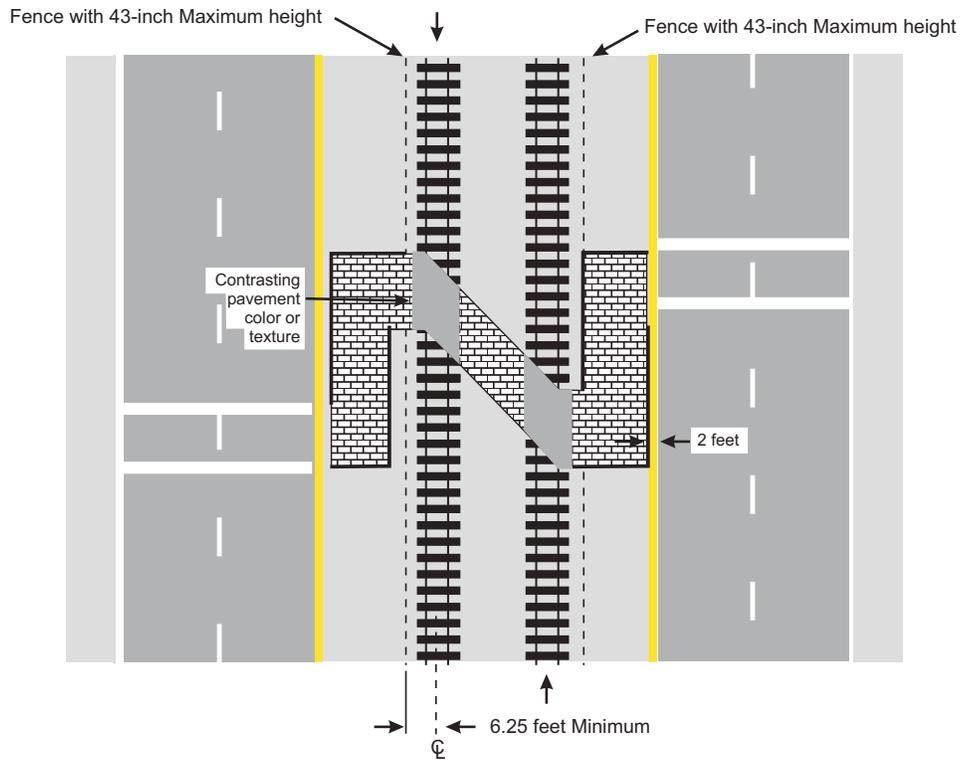
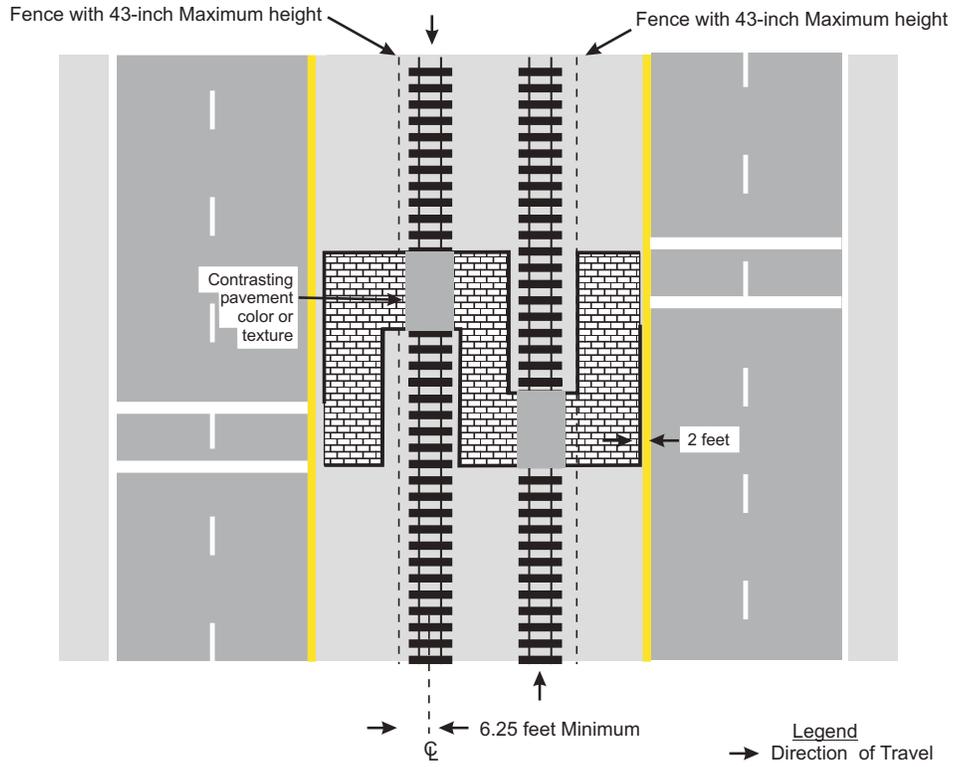


Figure 8C-10. Examples of Pedestrian Barrier Installation at an Offset Non-Intersection Grade Crossing

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

Chapter 8D. Pathway Grade Crossings

8D.1 Purpose

SUPPORT:

Traffic control for pathway grade crossings includes all signs, signals, markings, other warning devices, and their supports at pathway grade crossings and along pathway approaches to grade crossings. The function of this traffic control is to promote safety and provide effective operation of both rail and pathway traffic at pathway grade crossings.

Except as specifically provided in this Chapter, sidewalks are considered to be part of a highway-rail or highway-LRT grade crossing rather than a pathway grade crossing, and are covered by the provisions of Chapters 8B and 8C rather than by the provisions of this Chapter. However, many of the treatments outlined in this Chapter are applicable to sidewalks adjacent to highway-rail or highway-LRT grade crossings, including detectable warnings, swing gates, and automatic gates.

Crosswalks at intersections where pedestrians cross LRT tracks in mixed-use alignments are covered by the provisions of Section 3B.18 rather than by the provisions of this Chapter.

8D.2 Use of Standard Devices, Systems, and Practices

GUIDANCE:

The public agency with jurisdiction over the pathway and the regulatory agency with statutory authority, if applicable, should jointly determine the need and selection of devices at a pathway grade crossing, including the appropriate traffic control system to be used.

8D.3 Pathway Grade Crossing Signs and Markings

STANDARD:

Pathway grade crossing signs shall be standard in shape, legend, and color.

Traffic control devices mounted adjacent to pathways at a height of less than 8 feet measured vertically from the bottom edge of the device to the elevation of the near edge of the pathway surface shall have a minimum lateral offset of 2 feet from the near edge of the device to the near edge of the pathway (see Figure 9B-1).

The minimum mounting height for post-mounted signs on pathways shall be 4 feet, measured vertically from the bottom edge of the sign to the elevation of the near edge of the pathway surface (see Figure 9B-1).

Pathway grade crossing traffic control devices shall be located a minimum of 12 feet from the center of the nearest track.

The minimum sizes of pathway grade crossing signs shall be as shown in the shared-use path column in Table 9B-1.

When overhead traffic control devices are used on pathways, the clearance from the bottom edge of the device to the pathway surface directly under the sign or device shall be at least 8 feet.

GUIDANCE:

If pathway users include those who travel faster than pedestrians, such as bicyclists or skaters, the use of warning signs and pavement markings in advance of the pathway grade crossing (see Figure 8D-1) should be considered.

8D.4 Stop Lines, Edge Lines, and Detectable Warnings

GUIDANCE:

If used at pathway grade crossings, the pathway stop line should be a transverse line at the point where a pathway user is to stop. The pathway stop line should be placed at least 2 feet further from the nearest rail than the gate, counterweight, or flashing-light signals (if any of these are present) is placed, and at least 12 feet from the nearest rail.

OPTION:

Edge lines (see Section 3B.06) may be used on approach to and across the tracks at a pathway grade crossing, a sidewalk at a highway-rail or highway-LRT grade crossing, or a station crossing to delineate the designated pathway user route.

SUPPORT:

Edge line delineation can be beneficial where the distance across the tracks is long, commonly because of a skewed grade crossing or because of multiple tracks, or where the pathway surface is immediately adjacent to a traveled way.

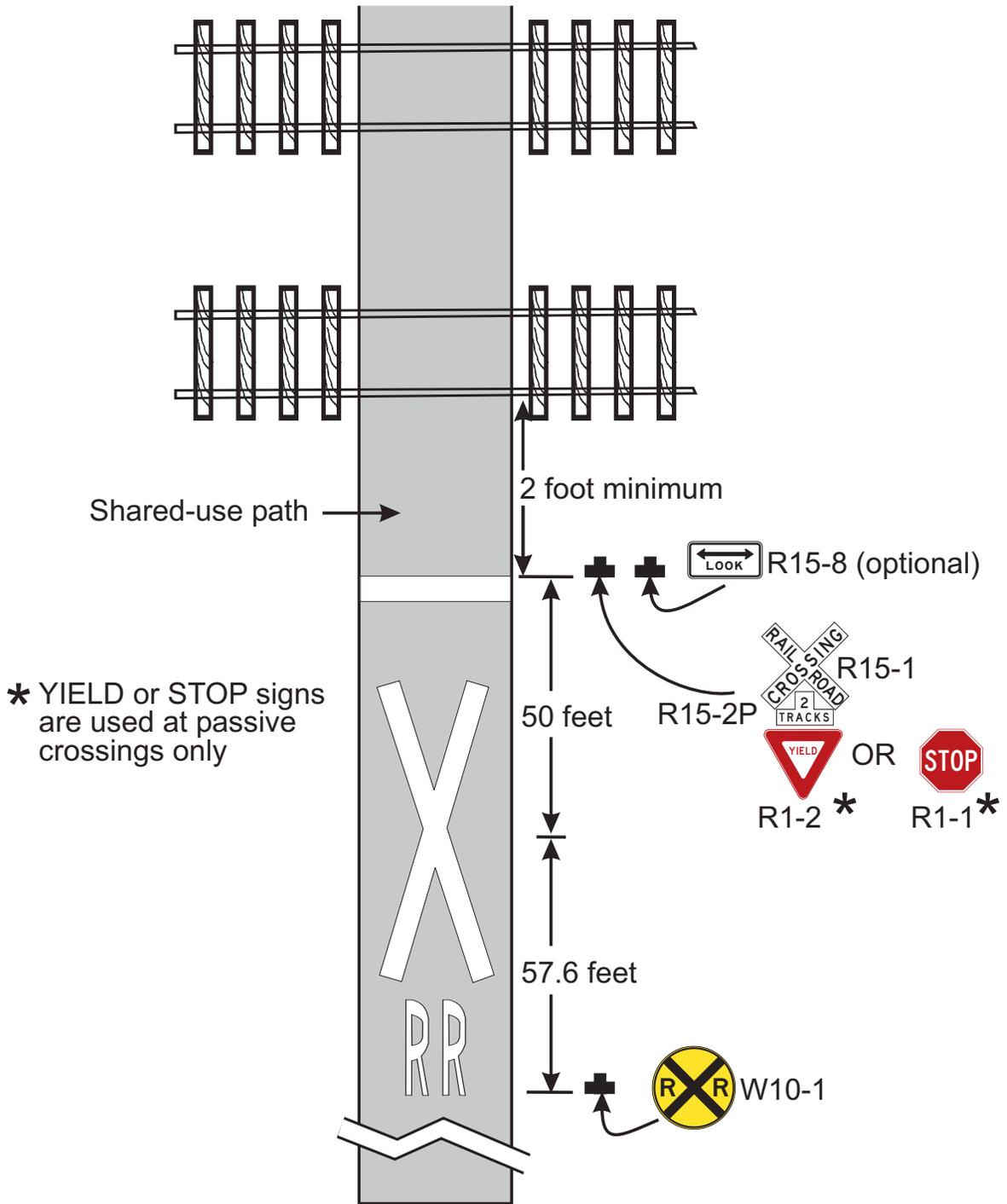


Figure 8D-1. Example of Signing and Markings for a Pathway Grade Crossing

Detectable warning surfaces (see Section 3B.18) that contrast visually with adjacent walking surfaces, either light-on-dark or dark-on-light, can be used to warn pedestrians about the locations of the tracks at a grade crossing. The "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11) contains specifications for design and placement of detectable warning surfaces.

8D.5 Passive Devices for Pathway Grade Crossings

STANDARD:

Except as provided in the following option, where active traffic control devices are not used, a Crossbuck Assembly shall be installed on each approach to a pathway grade crossing.

OPTION:

The Crossbuck Assembly may be omitted at station crossings and on the approaches to a pathway grade crossing that is located within 25 feet of the traveled way at a highway-rail or highway-LRT grade crossing.

GUIDANCE:

The pathway user's ability to detect the presence of approaching rail traffic should be considered in determining the type and placement of traffic control devices or design features (such as fencing or swing gates).

Nighttime visibility should be considered if design features (such as fencing or swing gates) are used to channelize pathway users.

If automatic gates and swing gates are used, the pathway should be channelized to direct users to the entrance to and exit from the pathway grade crossing.

STANDARD:

If used, swing gates shall be designed to open away from the track(s) so that pathway users can quickly push the gate open when moving away from the track(s). If used, swing gates shall be designed to automatically return to the closed position after each use.

OPTION:

When used in conjunction with automatic gates at pathway grade crossings, swing gates may be equipped with a latching device that permits the gate to be opened only from the track side of the gate.

SUPPORT:

The "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" (see Section 1A.11) contains information regarding spring hinges and door and gate opening forces for swing gates.

8D.6 Active Traffic Control Systems for Pathway Grade Crossings

STANDARD:

If used at a pathway grade crossing, an active traffic control system shall include flashing-light signals for each direction of the pathway. A bell or other audible warning device shall also be provided.

OPTION:

Separate active traffic control devices may be omitted at a pathway grade crossing that is located within 25 feet of the traveled way of a highway-rail or highway-LRT grade crossing that is equipped with an active traffic control system.

STANDARD:

If used at pathway grade crossings, alternately flashing red lights shall be aligned horizontally and the light units shall have a diameter of at least 4 inches. The minimum mounting height of the flashing red lights shall be 4 feet, measured vertically from the bottom edge of the lights to the elevation of the near edge of the pathway surface.

OPTION:

Traffic control devices may be installed between the tracks at multiple track crossings at stations.

STANDARD:

The mounting height for flashing lights that are installed between the tracks at multiple track crossings at stations shall be a minimum of 1 foot, measured vertically from the bottom edge of the lights to the elevation of the near edge of the pathway surface.

OPTION:

Automatic gates may be used at pathway grade crossings.

GUIDANCE:

If used at a pathway grade crossing, the height of the automatic gate arm when in the down position should be a minimum of 2.5 feet and a maximum of 4 feet above the sidewalk.

If used, the gate configuration, which might include a combination of automatic gates and swing gates, should provide for full width coverage of the pathway on both approaches to the track.

STANDARD:

Where a sidewalk is located between the edge of a roadway and the support for a gate arm that extends across the sidewalk and into the roadway, the location, placement, and height prescribed for vehicular gates shall be used (see Section 8C.4).

GUIDANCE:

If a separate automatic gate is used for a sidewalk, the height of the gate arm when in the down position should be a minimum of 2.5 feet and a maximum of 4 feet above the sidewalk.

If a separate automatic gate is used for a sidewalk at a highway-rail or highway-LRT grade crossing, instead of a supplemental or auxiliary gate arm installed as a part of the same mechanism as the vehicular gate, a separate mechanism should be provided for the sidewalk gate to prevent a pedestrian from raising the vehicular gate.