

Delaware Department of Transportation  
**Manual on Uniform Traffic  
Control Devices (MUTCD)**  
for Streets and Highways

PART 1  
**GENERAL**





<u>Legend</u>
DeIDOT Revision

**PART 1. GENERAL**  
**TABLE OF CONTENTS**

		<u>Page</u>
<b>CHAPTER 1A.</b>	<b>GENERAL</b>	
Section 1A.01	Purpose of Traffic Control Devices .....	1A-1
Section 1A.02	Principles of Traffic Control Devices .....	1A-1
Section 1A.03	Design of Traffic Control Devices.....	1A-2
Section 1A.04	Placement and Operation of Traffic Control Devices.....	1A-2
Section 1A.05	Maintenance of Traffic Control Devices .....	1A-2
Section 1A.06	Uniformity of Traffic Control Devices .....	1A-2
Section 1A.07	Responsibility for Traffic Control Devices.....	1A-3
Section 1A.08	Authority for Placement of Traffic Control Devices .....	1A-3
Section 1A.09	Engineering Study and Engineering Judgment.....	1A-4
Section 1A.10	Interpretations, Experimentations, Changes, and Interim Approvals .....	1A-4
Section 1A.11	Relation to Other Publications .....	1A-7
Section 1A.12	Color Code.....	1A-10
Section 1A.13	Definitions of Words and Phrases in This Manual .....	1A-10
Section 1A.14	Abbreviations Used on Traffic Control Devices .....	1A-14
 <b><u>FIGURES</u></b>		
<b>CHAPTER 1A.</b>	<b>GENERAL</b>	
Figure 1A-1	Example of Process for Requesting and Conducting Experimentations for New Traffic Control Devices.....	1A-6
Figure 1A-2	Example of Process for Incorporating New Traffic Control Devices into the MUTCD .....	1A-9
 <b><u>TABLES</u></b>		
<b>CHAPTER 1A.</b>	<b>GENERAL</b>	
Table 1A-1	Acceptable Abbreviations.....	1A-15
Table 1A-2	Abbreviations That Are Acceptable Only with a Prompt Word.....	1A-16
Table 1A-3	Unacceptable Abbreviations .....	1A-17

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## CHAPTER 1A. GENERAL

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

Support:

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

Traffic control devices notify road users of regulations and provide warning and guidance needed for the reasonably safe, uniform, and efficient operation of all elements of the traffic stream.

**Standard:**

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

Support:

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

See Section 2A.07 Option and Support regarding safety or transportation related messages on changeable signs.

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

Support:

This Manual contains the basic principles that govern the design and use of traffic control devices for all streets and highways open to public travel regardless of type or class or the public agency having jurisdiction. This Manual's text specifies the restriction on the use of a device if it is intended for limited application or for a specific system. It is important that these principles be given primary consideration in the selection and application of each device.

Guidance:

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

- A. Fulfill a need;
- B. Command attention;
- C. Convey a clear, simple meaning;
- D. Command respect from road users; and
- E. Give adequate time for proper response.

Design, placement, operation, maintenance, and uniformity are aspects that should be carefully considered in order to maximize the ability of a traffic control device to meet the five requirements listed in the previous paragraph. Vehicle speed should be carefully considered as an element that governs the design, operation, placement, and location of various traffic control devices, and should be based on the most appropriate speed data available.

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Support:

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

Guidance:

The actions required of road users to obey regulatory devices are specified by State statute, or in cases not covered by State statute, by local ordinance or resolution consistent with the "Uniform Vehicle Code."

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

Support:

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

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

Guidance:

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

**Standard:**

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**All symbols shall be unmistakably similar to or mirror images of the adopted symbol signs, all of which are shown in the “Standard Highway Signs” book or the DelDOT Standard Signs Book (see Section 1A.11). Symbols and colors shall not be modified unless otherwise stated herein. All symbols and colors for signs not shown in the “Standard Highway Signs” book or the DelDOT Standard Signs Book shall follow the procedures for experimentation and change described in Section 1A.10.**

Guidance:

Aspects of a device’s design should be modified only if there is a demonstrated need.

Support:

An example of modifying a device’s design would be to modify the Side Road (W2-2) sign to show a second offset intersecting road.

Option:

Highway agencies may develop word message signs to notify road users of special regulations or to warn road users of a situation that might not be readily apparent. Unlike symbol signs and colors, new word message signs may be used without the need for experimentation. With the exception of symbols and colors, minor modifications in the specific design elements of a device may be made provided the essential appearance characteristics are preserved. Although the standard design of symbol signs cannot be modified, it may be appropriate to change the orientation of the symbol to better reflect the direction of travel.

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

Guidance:

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

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

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

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

Guidance:

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

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

Support:

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

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

Support:

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

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

**Standard:**

**The responsibility for the design, placement, operation, maintenance, and uniformity of traffic control devices shall rest with the public agency or the official having jurisdiction. 23 CFR 655.603 adopts the Manual on Uniform Traffic Control Devices as the national standard for all traffic control devices installed on any street, highway, or bicycle trail open to public travel. When a State or other Federal agency manual or supplement is required, that manual or supplement shall be in substantial conformance with the national Manual on Uniform Traffic Control Devices.**

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

**Support:**

The “Uniform Vehicle Code” (see Section 1A.11) has the following provision in Section 15-104 for the adoption of a uniform Manual:

“(a)The [State Highway Agency] shall adopt a manual and specification for a uniform system of traffic control devices consistent with the provisions of this code for use upon highways within this State. Such uniform system shall correlate with and so far as possible conform to the system set forth in the most recent edition of the Manual on Uniform Traffic Control Devices for Streets and Highways, and other standards issued or endorsed by the Federal Highway Administrator.”

“(b) The Manual adopted pursuant to subsection (a) shall have the force and effect of law.”

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

Delaware Code Title 17, Chapter 1, §147, requires the state of Delaware to “adopt a uniform standard for each type of traffic-control device to be used on all highways open to the public in this State.” Delaware has adopted the Delaware MUTCD and the Delaware Sign Book to fulfill this requirement. The Delaware MUTCD addresses adaptations of the Federal Highway Administration (FHWA) MUTCD to Delaware’s experience.

Delaware Code Title 17, Chapter 1, §147, prohibits anyone from selling or offering for sale any traffic control device that does not conform with the “state manual and specifications”.

Delaware Code Title 17, Chapter 1, §147, states that “any traffic control device erected in violation of [the Delaware MUTCD], except experimental devices erected by the Department, shall be unofficial, unauthorized and unenforceable.”

Delaware Code Title 17, Chapter 1, §134, states that on “state highways within their corporate limits, incorporated cities and towns in the State may erect and maintain such traffic control signals as shall be authorized by proper ordinance of the city or town and by the Department.”

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

**Standard:**

**Traffic control devices, advertisements, announcements, and other signs or messages within the highway right-of-way shall be placed only as authorized by a public authority or the official having jurisdiction, for the purpose of regulating, warning, or guiding traffic.**

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

**Guidance:**

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

**Standard:**

**All regulatory traffic control devices shall be supported by laws, ordinances, or regulations.**

**Support:**

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

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

#### **Standard:**

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

#### **Guidance:**

The decision to use a particular device at a particular location should be made on the basis of either an engineering study or the application of engineering judgment. Thus, while this Manual provides Standards, Guidance, and Options for design and application of traffic control devices, this Manual should not be considered a substitute for engineering judgment.

Engineering judgment should be exercised in the selection and application of traffic control devices, as well as in the location and design of the roads and streets that the devices complement. Jurisdictions with responsibility for traffic control that do not have engineers on their staffs should seek engineering assistance from others, such as the State transportation agency, their County, a nearby large City, or a traffic engineering consultant.

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

#### **Standard:**

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

#### **Support:**

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

#### **Standard:**

**Requests for any interpretation, permission to experiment, interim approval, or change shall be sent to the Chief Traffic Engineer, Delaware Department of Transportation (DelDOT), P.O. Box 778, Dover, DE 19903.**

#### **Support:**

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

If the DelDOT Chief Traffic Engineer approves a request, then the request will be forwarded to the Federal Highway Administration (FHWA) and will follow the FHWA experimentation approval process.

#### **Guidance:**

Requests for an interpretation of this Manual should contain the following information:

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

#### **Support:**

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

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

A diagram indicating the process for experimenting with traffic control devices is shown in Figure 1A-1.

#### **Guidance:**

The request for permission to experiment should contain the following:

- A. A statement indicating the nature of the problem.
- B. A description of the proposed change to the traffic control device or application of the traffic control device, how it was developed, the manner in which it deviates from the standard, and how it is expected to be an improvement over existing standards.
- C. Any illustration that would be helpful to understand the traffic control device or use of the traffic control device.
- D. Any supporting data explaining how the traffic control device was developed, if it has been tried, in what ways it was found to be adequate or inadequate, and how this choice of device or application was derived.

- E. A legally binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright. (An example of a traffic control device concept would be countdown pedestrian signals in general. Ordinarily an entire general concept would not be patented or copyrighted, but if it were it would not be acceptable for experimentation unless the patent or copyright owner signs a waiver of rights acceptable to the FHWA. An example of a patented or copyrighted specific device within the general concept of countdown pedestrian signals would be a manufacturer's design for its specific brand of countdown signal, including the design details of the housing or electronics that are unique to that manufacturer's product. As long as the general concept is not patented or copyrighted, it is acceptable for experimentation to incorporate the use of one or more patented devices of one or several manufacturers.)
- F. The time period and location(s) of the experiment.
- G. A detailed research or evaluation plan that must provide for close monitoring of the experimentation, especially in the early stages of its field implementation. The evaluation plan should include before and after studies as well as quantitative data describing the performance of the experimental device.
- H. An agreement to restore the site of the experiment to a condition that complies with the provisions of this Manual within 3 months following the end of the time period of the experiment. This agreement must also provide that the agency sponsoring the experimentation will terminate the experimentation at any time that it determines significant safety concerns are directly or indirectly attributable to the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation at any time if there is an indication of safety concerns. If, as a result of the experimentation, a request is made that this Manual be changed to include the device or application being experimented with, the device or application will be permitted to remain in place until an official rulemaking action has occurred.
- I. An agreement to provide semiannual progress reports for the duration of the experimentation, and an agreement to provide a copy of the final results of the experimentation to the FHWA's Office of Transportation Operations within 3 months following completion of the experimentation. The FHWA's Office of Transportation Operations has the right to terminate approval of the experimentation if reports are not provided in accordance with this schedule.

Support:

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

Guidance:

Requests for a change to this Manual should contain the following information:

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

Support:

Requests for interim approval include consideration of allowing interim use, pending official rulemaking, of a new traffic control device, a revision to the application or manner of use of an existing traffic control device, or a provision not specifically described in this Manual. If granted, interim approval will result in the traffic control device or application being placed into the next scheduled rulemaking process for revisions to this Manual. The device or application will be permitted to remain in place, under any conditions established in the interim approval, until an official rulemaking action has occurred.

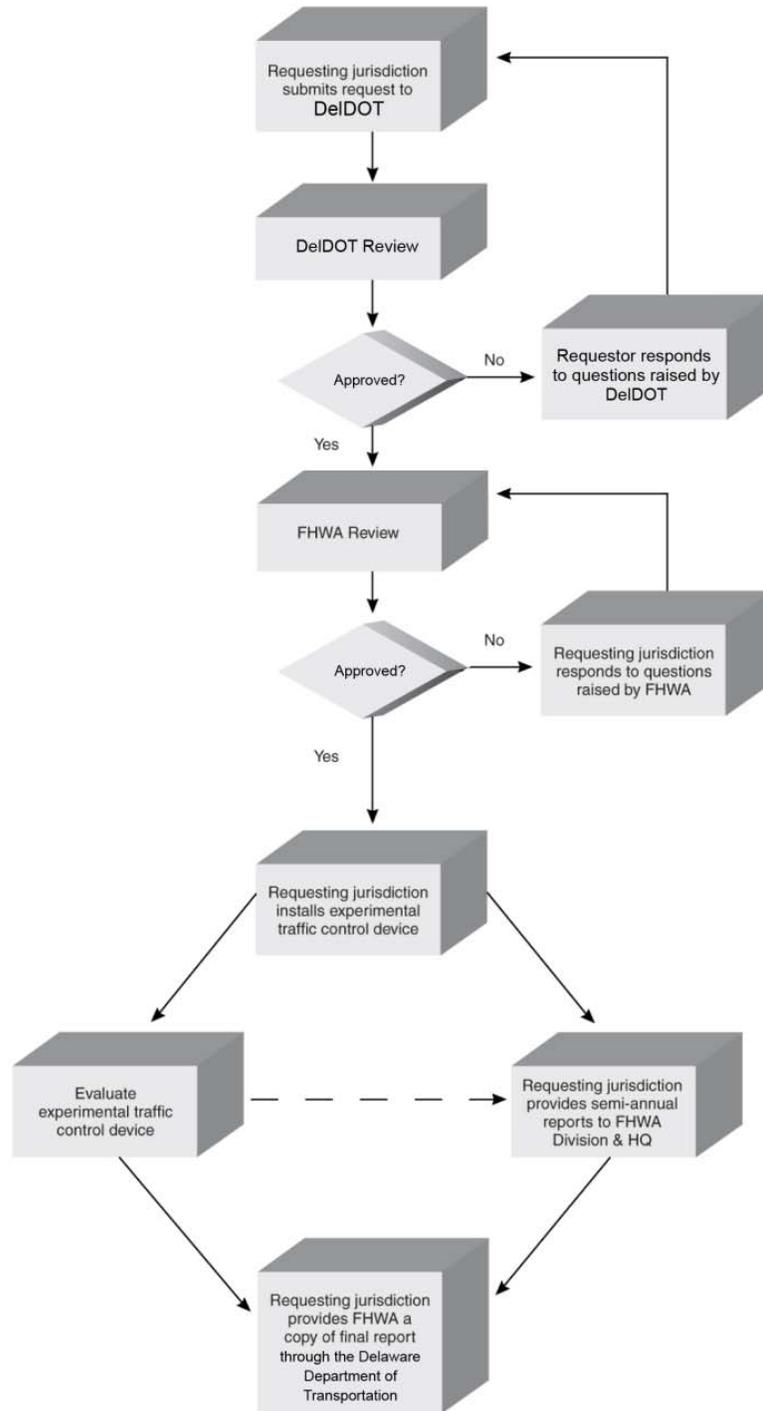
Interim approval is considered based on the results of successful experimentation, results of analytical or laboratory studies, and/or review of non-U.S. experience with a traffic control device or application. Interim approval considerations include an assessment of relative risks, benefits, and costs. Interim approval includes conditions that jurisdictions agree to comply with in order to use the traffic control device or application until an official rulemaking action has occurred.

Guidance:

The request for permission to place a traffic control device under interim approval should contain the following:

- A. A statement indicating the nature of the problem.
- B. A description of the proposed change to the traffic control device or application of the traffic control device, how it was developed, the manner in which it deviates from the standard, and how it is expected to be an improvement over existing standards.
- C. The location(s) where it will be used and any illustration that would be helpful to understand the traffic control device or use of the traffic control device.

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



- D. A legally-binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright. (An example of a traffic control device concept would be countdown pedestrian signals in general. Ordinarily an entire general concept would not be patented or copyrighted, but if it were it would not be acceptable for interim approval unless the patent or copyright owner signs a waiver of rights acceptable to the FHWA. An example of a patented or copyrighted specific device within the general concept of countdown pedestrian signals would be a manufacturer’s design for its specific brand of countdown signal, including the design details of the housing or electronics that are unique to that manufacturer’s product. Interim approval of a specific patented or copyrighted product is not acceptable.)
- E. A detailed completed research or evaluation on this traffic control device.
- F. An agreement to restore the site(s) of the interim approval to a condition that complies with the provisions in this Manual within 3 months following the issuance of a final rule on this traffic control device. This agreement must also provide that the agency sponsoring the interim approval will terminate use of the device or application installed under the interim approval at any time that it determines significant safety concerns are directly or indirectly attributable to the device or application. The FHWA’s Office of Transportation Operations has the right to terminate the interim approval at any time if there is an indication of safety concerns.

**Option:**

A State may submit a request for interim approval for all jurisdictions in that State, as long as the request contains the information listed in the Guidance above.

**Standard:**

**Once an interim approval is granted to any jurisdiction for a particular traffic control device or application, subsequent jurisdictions shall be granted interim approval for that device or application by submitting a letter to the FHWA Office of Transportation Operations indicating they will abide by Item F above and the specific conditions contained in the original interim approval.**

**A local jurisdiction using a traffic control device or application under an interim approval that was granted either directly to that jurisdiction or on a statewide basis based on the State’s request shall inform the State of the locations of such use.**

**Support:**

A diagram indicating the process for incorporating new traffic control devices into the FHWA MUTCD is shown in Figure 1A-2.

Procedures for revising the FHWA MUTCD are set out in the Federal Register of June 30, 1983 (48 FR 30145).

For additional information concerning interpretations, experimentation, changes, or interim approvals related to the FHWA MUTCD, write to the FHWA, 400 Seventh Street, SW, HOTO, Washington, DC 20590, or visit the MUTCD website at <http://mutcd.fhwa.dot.gov>.

For additional information concerning interpretations, experimentation, changes, or interim approvals related to the Delaware MUTCD, write to the Delaware Department of Transportation (DelDOT), P.O. Box 778, Dover, DE 19903, send an e-mail to [dotpr@state.de.us](mailto:dotpr@state.de.us), or visit the DelDOT website at <http://www.deldot.gov>.

Non-substantive editorial changes, clarifications, and minor revisions to the Delaware MUTCD, along with revisions required to match the Delaware MUTCD to amendments to relevant Federal or State law, will be approved by the Chief Traffic Engineer and posted on the DelDOT web site ([www.deldot.gov](http://www.deldot.gov)), and forwarded to the Delaware Register for inclusion in the state's Administrative Code. Any amendment requiring notice and comment in the Delaware Register under Administrative Procedures Act (Delaware Code, Title 29, Chapter 101) will take effect upon adoption under that procedure.

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

**Standard:**

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

**Support:**

The “Standard Highway Signs” book includes standard alphabets and symbols for highway signs and pavement markings.

For information about the above publications, visit the Federal Highway Administration’s MUTCD website at <http://mutcd.fhwa.dot.gov>, or write to the FHWA, 400 Seventh Street, SW, HOTO, Washington, DC 20590.

The publication entitled “Federal-Aid Highway Program Guidance on High Occupancy Vehicle (HOV) Lanes” is available at <http://www.fhwa.dot.gov/operations/hovguide01.htm>, or write to the FHWA, 400 Seventh Street, SW, HOTM, Washington, DC 20590.

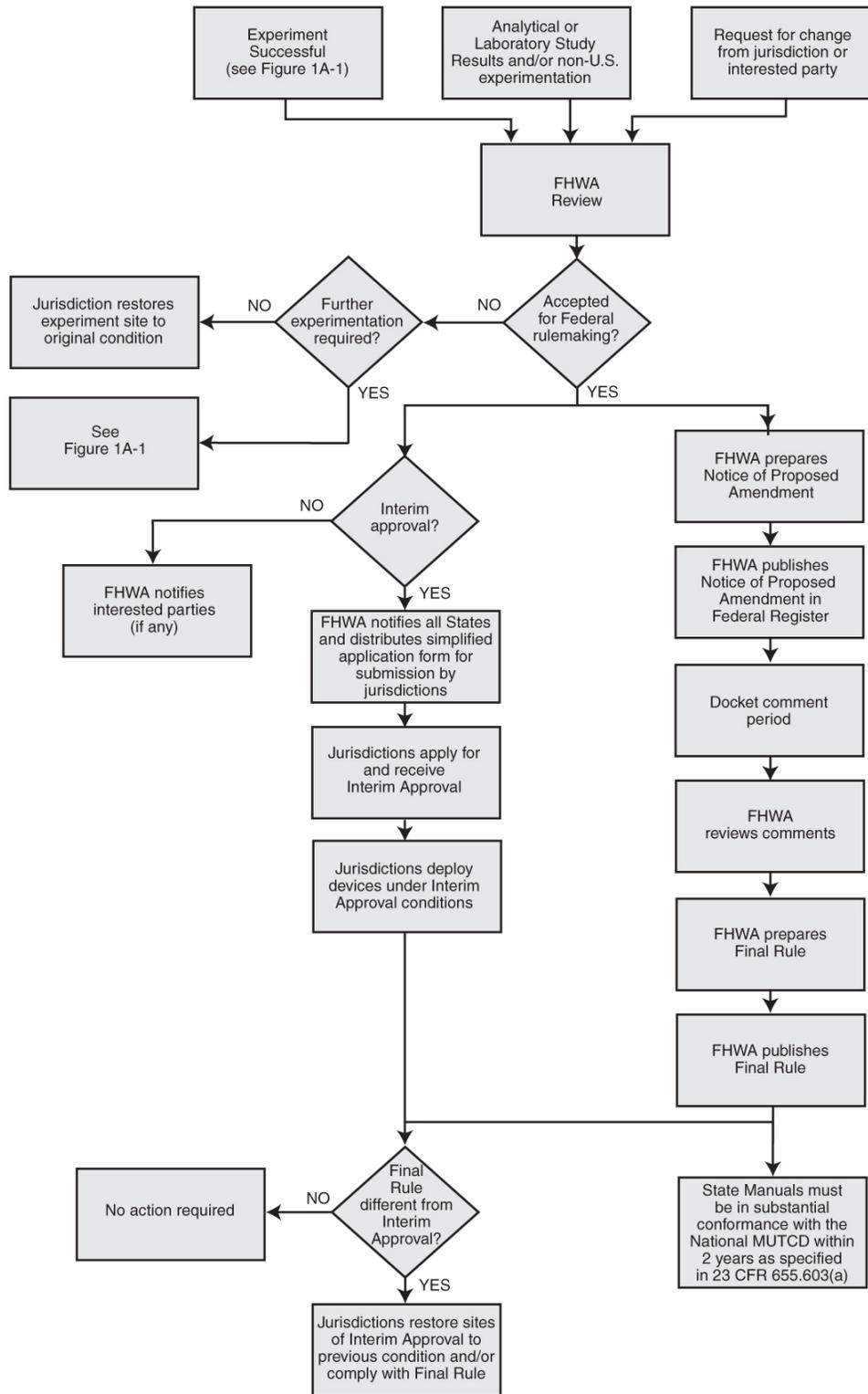
The “Delaware Sign Book” includes standard symbols and layouts for signs.

The “Delaware Sign Book” and the Delaware MUTCD are available for download on the DelDOT website at <http://www.deldot.gov>.

Other publications that are useful sources of information with respect to use of this Manual are listed below. See Page i of this Manual for ordering information for the following publications:

1. “A Policy on Geometric Design of Highways and Streets,” 2001 Edition (American Association of State Highway and Transportation Officials—AASHTO)
2. “Guide for the Development of Bicycle Facilities,” 1999 Edition (AASHTO)
3. “Guide to Metric Conversion,” 1993 Edition (AASHTO)
4. “Guidelines for the Selection of Supplemental Guide Signs for Traffic Generators Adjacent to Freeways,” 2001 Edition (AASHTO)
5. “List of Control Cities for Use in Guide Signs on Interstate Highways,” 2001 Edition (AASHTO)
6. “Roadside Design Guide,” 2001 Edition (AASHTO)
7. “Standard Specifications for Movable Highway Bridges,” 1988 Edition (AASHTO)
8. “Traffic Engineering Metric Conversion Folders— Addendum to the Guide to Metric Conversion,” 1993 Edition (AASHTO)
9. “2000 AREMA Communications & Signals Manual,” American Railway Engineering & Maintenance-of-Way Association (AREMA)
10. “Designing Sidewalks and Trails for Access—Part 2—Best Practices Design Guide,” 2001 Edition (FHWA) [Publication No. FHWA-EP-01-027]
11. “Practice for Roadway Lighting,” RP-8, 2001, Illuminating Engineering Society (IES)
12. “Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electric Detonators (Blasting Caps),” Safety Library Publication No. 20, Institute of Makers of Explosives
13. “American National Standard for High-Visibility Safety Apparel,” (ANSI/ISEA 107-1999), 1999 Edition, ISEA - The Safety Equipment Association.
14. “Manual of Traffic Signal Design,” 1998 Edition (Institute of Transportation Engineers—ITE)
15. “Manual of Transportation Engineering Studies,” 1994 Edition (ITE)
16. “Pedestrian Traffic Control Signal Indications,” 1985 Edition (ITE)
17. “Preemption of Traffic Signals at or Near Railroad Grade Crossings with Active Warning Devices,” (ITE)
18. “Purchase Specification for Flashing and Steady Burn Warning Lights,” 1981 Edition (ITE)
19. “School Trip Safety Program Guidelines,” 1984 Edition (ITE)
20. “Traffic Detector Handbook,” 1991 Edition (ITE)
21. “Traffic Engineering Handbook,” 1999 Edition (ITE)
22. “Traffic Signal Lamps,” 1980 Edition (ITE)
23. “Traffic Control Devices Handbook,” 2001 Edition (ITE)
24. “Vehicle Traffic Control Signal Heads,” Part 1—1985 Edition; Part 2—1998 Edition (ITE)
25. “Uniform Vehicle Code (UVC) and Model Traffic Ordinance,” 2000 Edition (National Committee on Uniform Traffic Laws and Ordinances)
26. “Occupational Safety and Health Administration Regulations (Standards - 29 CFR), General Safety and Health Provisions - 1926.20,” amended June 30, 1993, Occupational Safety and Health Administration (OSHA)
27. “Highway Capacity Manual,” 2000 Edition (Transportation Research Board—TRB)
28. “Recommended Procedures for the Safety Performance Evaluation of Highway Features,” (NCHRP Report 350), 1993 Edition (Transportation Research Board - TRB)
29. “Accessible Pedestrian Signals,” A-37, 1998 Edition, U.S. Architectural and Transportation Barriers Compliance Board (The U.S. Access Board)
30. “Building a True Community—Final Report—Public Rights-of-Way Access Advisory Committee (PRWAAC),” 2001 Edition (The U.S. Access Board)
31. “The Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG),” July 1998 Edition (The U.S. Access Board)
32. “Highway-Rail Intersection Architecture,” U.S. Department of Transportation, Federal Railroad Administration (USDOT/FRA)

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



## **Section 1A.12 Color Code**

Support:

The following color code establishes general meanings for 10 colors of a total of 13 colors that have been identified as being appropriate for use in conveying traffic control information. Central values and tolerance limits for each color are available from the Federal Highway Administration, 400 Seventh Street, SW, HOTO, Washington, DC 20590, and at FHWA's MUTCD website at <http://mutcd.fhwa.dot.gov>.

The three colors for which general meanings have not yet been assigned are being reserved for future applications that will be determined only by FHWA after consultation with the States, the engineering community, and the general public. The meanings described in this Section are of a general nature. More specific assignments of colors are given in the individual Parts of this Manual relating to each class of devices.

**Standard:**

The general meaning of the 13 colors shall be as follows:

- A. Black—regulation
- B. Blue—road user services guidance, tourist information, and evacuation route
- C. Brown—recreational and cultural interest area guidance
- D. Coral—unassigned
- E. Fluorescent Pink—incident management
- F. Fluorescent Yellow-Green—pedestrian warning, bicycle warning, playground warning, school bus and school warning
- G. Green—indicated movements permitted, direction guidance
- H. Light Blue—unassigned
- I. Orange—temporary traffic control
- J. Purple—unassigned
- K. Red—stop or prohibition
- L. White—regulation
- M. Yellow—warning

## **Section 1A.13 Definitions of Words and Phrases in This Manual**

**Standard:**

Unless otherwise defined herein, or in the other Parts of this Manual, definitions contained in the most recent edition of the "Uniform Vehicle Code," "AASHTO Transportation Glossary (Highway Definitions)," and other publications specified in Section 1A.11 are also incorporated and adopted by reference.

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

1. Active Grade Crossing Warning System—the flashing-light signals, with or without warning gates, together with the necessary control equipment used to inform road users of the approach or presence of trains at highway-rail or highway-light rail transit grade crossings.
2. Approach—all lanes of traffic moving towards an intersection or a midblock location from one direction, including any adjacent parking lane(s).
3. Arterial Highway (Street)—a general term denoting a highway primarily used by through traffic, usually on a continuous route or a highway designated as part of an arterial system.
4. Average Day—a day representing traffic volumes normally and repeatedly found at a location. Where volumes are primarily influenced by employment, the average day is typically a weekday. When volumes are primarily influenced by entertainment or recreation, the average day is typically a weekend day.
5. Beacon—a highway traffic signal with one or more signal sections that operates in a flashing mode.
6. Bicycle—a pedal-powered vehicle upon which the human operator sits.
7. Bicycle Lane—a portion of a roadway that has been designated by signs and pavement markings for preferential or exclusive use by bicyclists.
8. Centerline Markings—the yellow pavement marking line(s) that delineates the separation of traffic lanes that have opposite directions of travel on a roadway. These markings need not be at the geometrical center of the pavement.
9. Changeable Message Sign—a sign that is capable of displaying more than one message, changeable manually, by remote control, or by automatic control. These signs are referred to as Dynamic Message Signs in the National Intelligent Transportation Systems (ITS) Architecture.
10. Channelizing Line Marking—a wide or double solid white line used to form islands where traffic in the same direction of travel is permitted on both sides of the island.

11. **Circular Intersection**—an intersection that has an island, generally circular in design, located in the center of the intersection where traffic passes to the right of the island. Circular intersections include roundabouts, rotaries, and traffic circles.
12. **Clear Zone**—the total roadside border area, starting at the edge of the traveled way, that is available for an errant driver to stop or regain control of a vehicle. This area might consist of a shoulder, a recoverable slope, and/or a nonrecoverable, traversable slope with a clear run-out area at its toe.
13. **Concurrent Flow HOV Lane**—an HOV lane that is operated in the same direction as the adjacent mixed flow lanes, separated from the adjacent general purpose freeway lanes by a standard lane stripe, painted buffer, or barrier.
14. **Contraflow Lane**—a lane operating in a direction opposite to the normal flow of traffic designated for peak direction of travel during at least a portion of the day. Contraflow lanes are usually separated from the off-peak direction lanes by plastic pylons, or by moveable or permanent barrier.
15. **Conventional Road**—a street or highway other than a low-volume road (as defined in Section 5A.01), expressway, or freeway.
16. **Collector Highway**—a term denoting a highway that in rural areas connects small towns and local highways to arterial highways, and in urban areas provides land access and traffic circulation within residential, commercial, and business areas and connects local highways to the arterial highways.
17. **Crashworthy**—a characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the National Cooperative Highway Research Program Report 350, “Recommended Procedures for the Safety Performance Evaluation of Highway Features.”
18. **Crosswalk**—(a) that part of a roadway at an intersection included within the connections of the lateral lines of the sidewalks on opposite sides of the highway measured from the curbs or in the absence of curbs, from the edges of the traversable roadway, and in the absence of a sidewalk on one side of the roadway, the part of a roadway included within the extension of the lateral lines of the sidewalk at right angles to the centerline; (b) any portion of a roadway at an intersection or elsewhere distinctly indicated as a pedestrian crossing by lines on the surface, which may be supplemented by contrasting pavement texture, style, or color.
19. **Crosswalk Lines**—white pavement marking lines that identify a crosswalk.
20. **Delineator**—a retroreflective device mounted on the roadway surface or at the side of the roadway in a series to indicate the alignment of the roadway, especially at night or in adverse weather.
21. **Detectable**—having a continuous edge within 150 mm (6 in) of the surface so that pedestrians who have visual disabilities can sense its presence and receive usable guidance information.
22. **Dynamic Envelope**—the clearance required for the train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure.
23. **Edge Line Markings**—white or yellow pavement marking lines that delineate the right or left edge(s) of a traveled way.
24. **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.
25. **Engineering Judgment**—the evaluation of available pertinent information, and the application of appropriate principles, Standards, Guidance, 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.
26. **Engineering Study**—the comprehensive analysis and evaluation of available pertinent information, and the application of appropriate principles, Standards, Guidance, 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.
27. **Expressway**—a divided highway with partial control of access.
28. **Flashing**—an operation in which a signal indication is turned on and off repetitively.
29. **Freeway**—a divided highway with full control of access.
30. **Guide Sign**—a sign that shows route designations, destinations, directions, distances, services, points of interest, or other geographical, recreational, or cultural information.
31. **High Occupancy Vehicle (HOV)**—a motor vehicle carrying at least two or more persons, including carpools, vanpools, and buses.
32. **Highway**—a general term for denoting a public way for purposes of travel by vehicular travel, including the entire area within the right-of-way.

33. **Highway-Rail Grade Crossing**—the general area where a highway and a railroad’s right-of-way cross at the same level, within which are included the railroad tracks, highway, and traffic control devices for highway traffic traversing that area.
34. **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 signals at toll plazas, power-operated signs, illuminated pavement markers, warning lights (see Section 6F.78), or steady burning electric lamps.
35. **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.
36. **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.
37. **Interchange**—a system of interconnecting roadways providing for traffic movement between two or more highways that do not intersect at grade.
38. **Intermediate Interchange**—an interchange with an urban or rural route that is not a major or minor interchange as defined herein.
39. **Intersection**—(a) the area embraced within the prolongation or connection of the lateral curb lines, or if none, the lateral boundary lines of the roadways of two highways that join one another at, or approximately at, right angles, or the area within which vehicles traveling on different highways that join at any other angle might come into conflict; (b) the junction of an alley or driveway with a roadway or highway shall not constitute an intersection.
40. **Island**—a defined area between traffic lanes for control of vehicular movements or for pedestrian refuge. It includes all end protection and approach treatments. Within an intersection area, a median or an outer separation is considered to be an island.
41. **Lane Line Markings**—white pavement marking lines that delineate the separation of traffic lanes that have the same direction of travel on a roadway.
42. **Lane-Use Control Signal**—a signal face displaying indications to permit or prohibit the use of specific lanes of a roadway or to indicate the impending prohibition of such use.
43. **Legend**—see Sign Legend.
44. **Logo**—a distinctive emblem, symbol, or trademark that identifies a product or service.
45. **Longitudinal Markings**—pavement markings that are generally placed parallel and adjacent to the flow of traffic such as lane lines, centerlines, edge lines, channelizing lines, and others.
46. **Major Interchange**—an interchange with another freeway or expressway, or an interchange with a high-volume multi-lane highway, principal urban arterial, or major rural route where the interchanging traffic is heavy or includes many road users unfamiliar with the area.
47. **Major Street**—the street normally carrying the higher volume of vehicular traffic.
48. **Median**—the area between two roadways of a divided highway measured from edge of traveled way to edge of traveled way. The median excludes turn lanes. The median width might be different between intersections, interchanges, and at opposite approaches of the same intersection.
49. **Minor Interchange**—an interchange where traffic is local and very light, such as interchanges with land service access roads. Where the sum of the exit volumes is estimated to be lower than 100 vehicles per day in the design year, the interchange is classified as local.
50. **Minor Street**—the street normally carrying the lower volume of vehicular traffic.
51. **Object Marker**—a device used to mark obstructions within or adjacent to the roadway.
52. **Occupancy Requirement**—any restriction that regulates the use of a facility for any period of the day based on a specified number of persons in a vehicle.
53. **Occupant**—a person driving or riding in a car, truck, bus, or other vehicle.
54. **Paved**—a bituminous surface treatment, mixed bituminous concrete, or Portland cement concrete roadway surface that has both a structural (weight bearing) and a sealing purpose for the roadway.
55. **Pedestrian**—a person afoot, in a wheelchair, on skates, or on a skateboard.
56. **Pedestrian Facilities**—a general term denoting improvements and provisions made to accommodate or encourage walking.
57. **Platoon**—a group of vehicles or pedestrians traveling together as a group, either voluntarily or involuntarily, because of traffic signal controls, geometrics, or other factors.
58. **Principal Legend**—place names, street names, and route numbers placed on guide signs.
59. **Public Road**—any road or street under the jurisdiction of and maintained by a public agency and open to public travel.

60. **Raised Pavement Marker**—a device with a height of at least 10 mm (0.4 in) mounted on or in a road surface that is intended to be used as a positioning guide or to supplement or substitute for pavement markings or to mark the position of a fire hydrant.
61. **Regulatory Sign**—a sign that gives notice to road users of traffic laws or regulations.
62. **Retroreflectivity**—a property of a surface that allows a large portion of the light coming from a point source to be returned directly back to a point near its origin.
63. **Right-of-Way [Assignment]**—the permitting of vehicles and/or pedestrians to proceed in a lawful manner in preference to other vehicles or pedestrians by the display of sign or signal indications.
64. **Road**—see Roadway.
65. **Roadway**—that portion of a highway improved, designed, or ordinarily used for vehicular travel and parking lanes, but exclusive of the sidewalk, berm, or shoulder even though such sidewalk, berm, or shoulder is used by persons riding bicycles or other human-powered vehicles. In the event a highway includes two or more separate roadways, the term roadway as used herein shall refer to any such roadway separately, but not to all such roadways collectively.
66. **Roadway Network**—a geographical arrangement of intersecting roadways.
67. **Road User**—a vehicle operator, bicyclist, or pedestrian within the highway, including persons with disabilities.
68. **Roundabout Intersection**—a circular intersection with yield control of all entering traffic, channelized approaches, and appropriate geometric curvature, such that travel speeds on the circulatory roadway are typically less than 50 km/h (30 mph).
69. **Rumble Strip**—a series of intermittent, narrow, transverse areas of rough-textured, slightly raised, or depressed road surface that is installed to alert road users to unusual traffic conditions.
70. **Rural Highway**—a type of roadway normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians.
71. **Shared Roadway**—a roadway that is officially designated and marked as a bicycle route, but which is open to motor vehicle travel and upon which no bicycle lane is designated.
72. **Shared-Use Path**—a bikeway outside the traveled way and physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent alignment. Shared-use paths are also used by pedestrians (including skaters, users of manual and motorized wheelchairs, and joggers) and other authorized motorized and non-motorized users.
73. **Sidewalk**—that portion of a street between the curb line, or the lateral line of a roadway, and the adjacent property line or on easements of private property that is paved or improved and intended for use by pedestrians.
74. **Sign**—any traffic control device that is intended to communicate specific information to road users through a word or symbol legend. Signs do not include traffic control signals, pavement markings, delineators, or channelization devices.
75. **Sign Assembly**—a group of signs, located on the same support(s), that supplement one another in conveying information to road users.
76. **Sign Illumination**—either internal or external lighting that shows similar color by day or night. Street or highway lighting shall not be considered as meeting this definition.
77. **Sign Legend**—all word messages, logos, and symbol designs that are intended to convey specific meanings.
78. **Sign Panel**—a separate panel or piece of material containing a word or symbol legend that is affixed to the face of a sign.
79. **Speed**—speed is defined based on the following classifications:
  - (a) **Advisory Speed**—a recommended speed for all vehicles operating on a section of highway and based on the highway design, operating characteristics, and conditions.
  - (b) **Average Speed**—the summation of the instantaneous or spot-measured speeds at a specific location of vehicles divided by the number of vehicles observed.
  - (c) **Design Speed**—a selected speed used to determine the various geometric design features of a roadway.
  - (d) **85th-Percentile Speed**—The speed at or below which 85 percent of the motor vehicles travel.
  - (e) **Operating Speed**—a speed at which a typical vehicle or the overall traffic operates. Operating speed might be defined with speed values such as the average, pace, or 85th-percentile speeds.
  - (f) **Pace Speed**—the highest speed within a specific range of speeds that represents more vehicles than in any other like range of speed. The range of speeds typically used is 10 km/h or 10 mph.
  - (g) **Posted Speed**—the speed limit determined by law and shown on Speed Limit signs.
  - (h) **Statutory Speed**—a speed limit established by legislative action that typically is applicable for highways with specified design, functional, jurisdictional and/or location characteristic and is not necessarily shown on Speed Limit signs.

80. **Speed Limit**—the maximum (or minimum) speed applicable to a section of highway as established by law.
81. **Speed Measurement Marking**—a white transverse pavement marking placed on the roadway to assist the enforcement of speed regulations.
82. **Speed Zone**—a section of highway with a speed limit that is established by law but which might be different from a legislatively specified statutory speed limit.
83. **Stop Line**—a solid white pavement marking line extending across approach lanes to indicate the point at which a stop is intended or required to be made.
84. **Street**—see Highway.
85. **Temporary Traffic Control Zone**—an area of a highway where road user conditions are changed because of a work zone or incident by the use of temporary traffic control devices, flaggers, uniformed law enforcement officers, or other authorized personnel.
86. **Traffic**—pedestrians, bicyclists, ridden or herded animals, vehicles, streetcars, and other conveyances either singularly or together while using any highway for purposes of travel.
87. **Traffic Control Device**—a sign, signal, marking, or other device used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, or shared-use path by authority of a public agency having jurisdiction.
88. **Traffic Control Signal (Traffic Signal)**—any highway traffic signal by which traffic is alternately directed to stop and permitted to proceed.
89. **Train**—one or more locomotives coupled, with or without cars, that operates on rails or tracks and to which all other traffic must yield the right-of-way by law at highway-rail grade crossings.
90. **Transverse Markings**—pavement markings that are generally placed perpendicular and across the flow of traffic such as shoulder markings, word and symbol markings, stop lines, crosswalk lines, speed measurement markings, parking space markings, and others.
91. **Traveled Way**—the portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.
92. **Urban Street**—a type of street normally characterized by relatively low speeds, wide ranges of traffic volumes, narrower lanes, frequent intersections and driveways, significant pedestrian traffic, and more businesses and houses.
93. **Vehicle**—every device in, upon, or by which any person or property can be transported or drawn upon a highway, except trains and light rail transit operating in exclusive or semiexclusive alignments. Light rail transit operating in a mixed-use alignment, to which other traffic is not required to yield the right-of-way by law, is a vehicle.
94. **Warning Sign**—a sign that gives notice to road users of a situation that might not be readily apparent.
95. **Warrant**—a warrant describes threshold conditions to the engineer in evaluating the potential safety and operational benefits of traffic control devices and is based upon average or normal conditions. Warrants are not a substitute for engineering judgment. The fact that a warrant for a particular traffic control device is met is not conclusive justification for the installation of the device.
95. **Wrong-Way Arrow**—a slender, elongated, white pavement marking arrow placed upstream from the ramp terminus to indicate the correct direction of traffic flow. Wrong-way arrows are intended primarily to warn wrong-way road users that they are going in the wrong direction.

#### **Section 1A.14 Abbreviations Used on Traffic Control Devices**

##### **Standard:**

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

##### **Guidance:**

The abbreviations for the words listed in Table 1A-2 should not be used in connection with traffic control devices unless the prompt word shown in Table 1A-2 either precedes or follows the abbreviation.

##### **Standard:**

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

##### **Guidance:**

Where multiple abbreviations are permitted in Tables 1A-1 or 1A-2, the same abbreviation should be used throughout a single jurisdiction.

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

<b>Word Message</b>	<b>Standard Abbreviation</b>
Afternoon / Evening	PM
Alternate	ALT
Avenue	AVE, AV
Bicycle	BIKE
Boulevard	BLVD
Cannot	CANT
CB Radio	CB
Center	CNTR
Circle	CIR
Civil Defense	CD
Compressed Natural Gas	CNG
Court	CT
Crossing (other than highway-rail)	XING
Diesel Fuel	D
Do Not	DON'T
Drive	DR
East	E
Eastbound	E-BND
Electric Vehicle	EV
Emergency	EMER
Entrance, Enter	ENT
Expressway	EXPWY
Feet	FT
FM Radio	FM
Freeway	FRWY, FWY
Friday	FRI
Hazardous Material	HAZMAT
High Occupancy Vehicle	HOV
Highway	HWY
Highway-Rail Grade Crossing	RXR
Pavement Marking	
Hospital	H
Hour(s)	HR
Information	INFO
Inherently Low Emission Vehicle	ILEV
It is	ITS
Junction / Intersection	JCT
Kilogram	kg
Kilometer(s)	km
Kilometers Per Hour	km/h
Lane	LN
Left	LFT
Liquid Propane Gas	LP-GAS

<b>Word Message</b>	<b>Standard Abbreviation</b>
Maintenance	MAINT
Meter(s)	m
Metric Ton	t
Mile(s)	MI
Miles Per Hour	MPH
Minute(s)	MIN
Monday	MON
Morning / Late Night	AM
Normal	NORM
North	N
Northbound	N-BND
Parking	PKING
Parkway	PKWY
Pedestrian	PED
Place	PL
Pounds	LBS
Right	RHT
Road	RD
Saturday	SAT
Service	SERV
Shoulder	SHLDR
Slippery	SLIP
South	S
Southbound	S-BND
Speed	SPD
Street	ST
Sunday	SUN
Telephone	PHONE
Temporary	TEMP
Terrace	TER
Thursday	THURS
Tires With Lugs	LUGS
Tons of Weight	T
Traffic	TRAF
Trail	TR
Travelers	TRAVLRS
Tuesday	TUES
Two-Way Intersection	2-WAY
Two-Wheeled Vehicles	CYCLES
US Numbered Route	US
Vehicle(s)	VEH
Warning	WARN
Wednesday	WED
West	W
Westbound	W-BND
Will Not	WONT

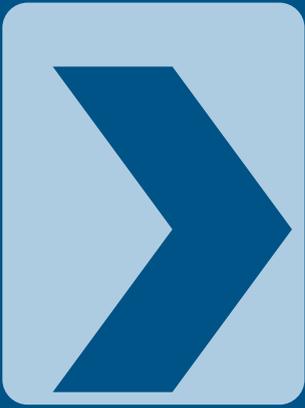
**Table 1A-2. Abbreviations That Are Acceptable  
Only with a Prompt Word**

<b>Word</b>	<b>Abbreviation</b>	<b>Prompt Word</b>
Access	ACCS	Road
Ahead	AHD	Fog*
Blocked	BLKD	Lane*
Bridge	BRDG	[Name]*
Chemical	CHEM	Spill
Condition	COND	Traffic*
Congested	CONG	Traffic*
Construction	CONST	Ahead
Downtown	DWNTN	Traffic
Exit	EX, EXT	Next*
Express	EXP	Lane
Frontage	FRTNG	Road
Hazardous	HAZ	Driving
Interstate	I	[Number]
Local	LOC	Traffic
Lower	LWR	Level
Major	MAJ	Accident
Minor	MNR	Accident
Oversized	OVRSZ	Load
Prepare	PREP	To Stop
Pavement	PVMT	Wet*
Quality	QLTY	Air*
Roadwork	RDWK	Ahead [Distance]
Route	RT, RTE	Best*
Township	TWNSHP	Limits
Turnpike	TRNPK	[Name]*
Upper	UPR	Level

\* These prompt words should precede the abbreviation

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

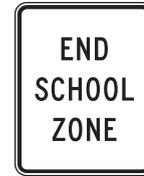
<b>Abbreviation</b>	<b>Intended Word</b>	<b>Common Misinterpretations</b>
ACC	Accident	Access (Road)
CLRS	Clears	Colors
DLY	Delay	Daily
FDR	Feeder	Federal
L	Left	Lane (Merge)
LT	Light (Traffic)	Left
PARK	Parking	Park
POLL	Pollution (Index)	Roll
RED	Reduce	Red
STAD	Stadium	Standard
WRNG	Warning	Wrong



Delaware Department of Transportation  
**Manual on Uniform Traffic  
Control Devices (MUTCD)**  
for Streets and Highways

# PART 7

## TRAFFIC CONTROLS FOR SCHOOL AREAS







<u>Legend</u>
DeIDOT Revision

## PART 7. TRAFFIC CONTROLS FOR SCHOOL AREAS

### TABLE OF CONTENTS

		<u>Page</u>
<b>CHAPTER 7A. GENERAL</b>		
Section 7A.01	Need for Standards .....	7A-1
Section 7A.02	School Routes and Established School Crossings .....	7A-1
Section 7A.03	School Crossing Control Criteria .....	7A-2
Section 7A.04	Scope .....	7A-4
Section 7A.05	Application of Standards .....	7A-4
Section 7A.06	Engineering Study Required.....	7A-4
Section 7A.07	Maintenance of Traffic Control Devices .....	7A-4
Section 7A.08	Placement Authority.....	7A-4
Section 7A.09	Unauthorized Devices and Messages .....	7A-4
Section 7A.10	Meaning of Standard, Guidance, Option, and Support.....	7A-4
<b>CHAPTER 7B. SIGNS</b>		
Section 7B.01	Size of School Signs.....	7B-1
Section 7B.02	Illumination and Reflectorization.....	7B-1
Section 7B.03	Position of Signs.....	7B-1
Section 7B.04	Height of Signs.....	7B-1
Section 7B.05	Installation of Signs.....	7B-1
Section 7B.06	Lettering .....	7B-1
Section 7B.07	Sign Color for School Warning Signs .....	7B-2
Section 7B.08	School Advance Warning Assembly (S1-1 with Supplemental Plaque) .....	7B-2
Section 7B.09	School Crosswalk Warning Assembly (S1-1 with Diagonal Arrow) .....	7B-4
Section 7B.10	SCHOOL BUS STOP AHEAD Sign (S3-1) .....	7B-4
Section 7B.11	School Speed Limit Assembly (S4-1, S4-2, S4-3, S4-4, S4-6, S5-1).....	7B-9
Section 7B.12	Reduced Speed School Zone Ahead Sign (S4-5, S4-5a).....	7B-10
Section 7B.13	END SCHOOL ZONE Sign (S5-2).....	7B-10
Section 7B.14	Parking and Stopping Signs (R7 and R8 Series) .....	7B-10
Section 7B.15	DRUG FREE SCHOOL ZONE Sign (S5-2-DE) .....	7B-11
<b>CHAPTER 7C. MARKINGS</b>		
Section 7C.01	Functions and Limitations .....	7C-1
Section 7C.02	Standardization of Application.....	7C-1
Section 7C.03	Crosswalk Markings.....	7C-1
Section 7C.04	Stop and Yield Lines .....	7C-1
Section 7C.05	Curb Markings for Parking Regulations.....	7C-2
Section 7C.06	Pavement Word and Symbol Markings.....	7C-3
<b>CHAPTER 7D. SIGNALS</b>		
Section 7D.01	General .....	7D-1
Section 7D.02	Flashing Beacons at School Crossings .....	7D-1
<b>CHAPTER 7E. CROSSING SUPERVISION</b>		
Section 7E.01	Types of Crossing Supervision.....	7E-1
Section 7E.02	Adult Crossing Guards .....	7E-1
Section 7E.03	Qualifications of Adult Crossing Guards .....	7E-1
Section 7E.04	Uniform of Adult Crossing Guards and Student Patrols .....	7E-1
Section 7E.05	Operating Procedures for Adult Crossing Guards .....	7E-2
Section 7E.06	Uniformed Law Enforcement Officers.....	7E-2
Section 7E.07	Student Patrols.....	7E-2
Section 7E.08	Choice of Student Patrols .....	7E-3
Section 7E.09	Operating Procedures for Student Patrols.....	7E-3

**CHAPTER 7F. GRADE-SEPARATED CROSSINGS**

Section 7F.01	Function.....	7F-1
Section 7F.02	Types of Grade-Separated Crossings .....	7F-1
Section 7F.03	Criteria for Use of Grade-Separated Crossings .....	7F-1

**FIGURES**

**CHAPTER 7A. GENERAL**

Figure 7A-1	Example of School Route Plan Map.....	7A-3
-------------	---------------------------------------	------

**CHAPTER 7B. SIGNS**

Figure 7B-1	School Area Signs .....	7B-5
Figure 7B-2	Examples of Signing for School Crosswalk Warning Assembly .....	7B-6
Figure 7B-3	Examples of Signing for School Area Traffic Control with School Speed Limits .....	7B-7
Figure 7B-3a	Examples of School Crossing Signing Not Adjacent to School Property .....	7B-8
Figure 7B-4	In-Street Signs in School Areas.....	7B-9

**CHAPTER 7C. MARKINGS**

Figure 7C-1	Two-Lane Pavement Marking of “SCHOOL” .....	7C-4
-------------	---	------

**TABLES**

**CHAPTER 7B. SIGNS**

Table 7B-1	Size of School Area Signs and Plaques .....	7B-3
------------	---	------

## CHAPTER 7A. GENERAL

### **Section 7A.01 Need for Standards**

#### Support:

It is important to stress that regardless of the school location, the best way to achieve reasonably safe and effective traffic control is through the uniform application of realistic policies, practices, and standards developed through engineering judgment.

Pedestrian safety depends upon public understanding of accepted methods for efficient traffic control. This principle is especially important in the control of pedestrians, bicycles, and other vehicles in the vicinity of schools. Neither pedestrians on their way to or from school nor road users can be expected to move safely in school areas unless they understand both the need for traffic controls and how these controls function for their benefit.

Procedures and devices that are not uniform might cause confusion among pedestrians and road users, prompt wrong decisions, and contribute to crashes. To achieve uniformity of traffic control in school areas, comparable traffic situations need to be treated in a consistent manner. Each traffic control device and control method described in Part 7 fulfills a specific function related to specific traffic conditions.

A uniform approach to school area traffic controls assures the use of similar controls for similar situations (which promotes uniform behavior on the part of motorists, pedestrians, and bicyclists).

A school traffic control plan permits the orderly review of school area traffic control needs, and the coordination of school/pedestrian safety education and engineering activities.

#### Guidance:

A school route plan for each school serving elementary to high school students should be prepared in order to develop uniformity in the use of school area traffic controls and to serve as the basis for a school traffic control plan for each school.

The school route plan, developed in a systematic manner by the school, law enforcement, and traffic officials responsible for school pedestrian safety, should consist of a map (see Figure 7A-1) showing streets, the school, existing traffic controls, established school walk routes, and established school crossings.

The type(s) of school area traffic control devices used, either warning or regulatory, should be related to the volume and speed of vehicular traffic, street width, and the number and age of the students using the crossing.

School area traffic control devices should be included in a school traffic control plan.

#### Support:

Reduced speed limit signs for school areas and crossings are included in this Manual solely for the purpose of standardizing signing for these zones and not as an endorsement of mandatory reduced speed zones.

In Delaware, as specified in the Delaware Code (Title 21, Chapter 41, Subchapter VIII, §4169), the speed limit within a School Zone shall be 20 mph where 20 mph regulatory signs are in effect during specific periods. While 20 mph is the minimum speed limit within a school zone, there may be mitigating circumstances that warrant a higher limit. The appropriate speed limit should be established in accordance with the results of a traffic engineering study.

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### **Section 7A.02 School Routes and Established School Crossings**

#### Support:

The planning criterion for school walk routes might make it necessary for children to walk an indirect route to an established school crossing located where there is existing traffic control and to avoid the use of a direct crossing where there is no existing traffic control.

#### Guidance:

School walk routes should be planned to take advantage of existing traffic controls.

The following factors should be considered when determining the feasibility of requiring children to walk a longer distance to a crossing with existing traffic control:

- A. The availability of adequate sidewalks or off-roadway sidewalk areas to and from the location with existing control;
- B. The number of students using the crossing;
- C. The age levels of the students using the crossing;
- D. The total extra walking distance;
- E. The presence of a school crossing guard; and
- F. The location of the crossing, avoiding locations where the presence of pedestrians crossing the road is unexpected.

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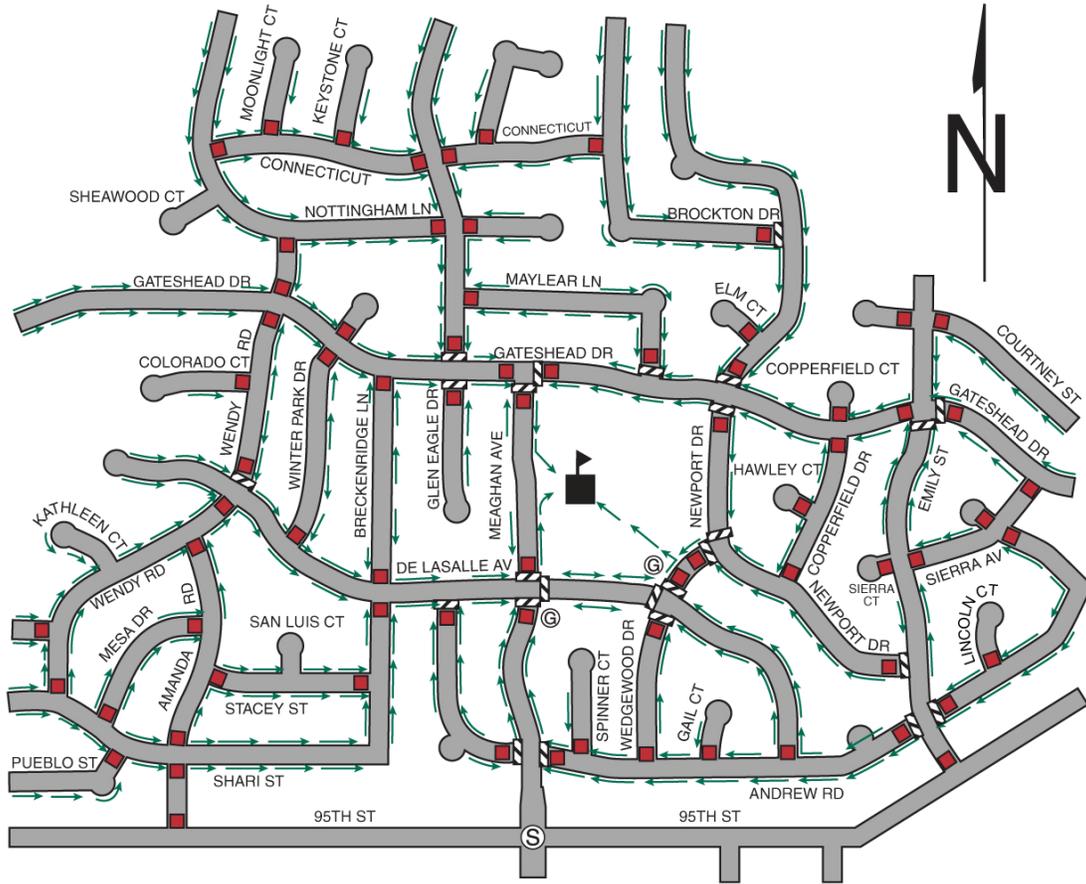
**Section 7A.03 School Crossing Control Criteria**

Support:

Alternate gaps and blockades are inherent in the traffic stream and are different at each crossing location. For safety, students need to wait for a gap in traffic that is of sufficient duration to permit reasonably safe crossing. When the delay between the occurrence of adequate gaps becomes excessive, students might become impatient and endanger themselves by attempting to cross the street during an inadequate gap.

A recommended method for determining the frequency and adequacy of gaps in the traffic stream is given in the Institute of Transportation Engineers' publication, "School Trip Safety Program Guidelines" (see Section 1A.11).

Figure 7A-1. Example of School Route Plan Map



Legend

- |   |                  |   |                         |
|---|------------------|---|-------------------------|
|  | School           |  | Signalized Intersection |
|  | Marked Crosswalk |  | STOP Sign Approach      |
|  | Crossing Guard   |  | Pedestrian Route        |

**Section 7A.04 Scope****Standard:**

**Part 7 sets forth basic principles and prescribes standards that shall be followed in the design, application, installation, and maintenance of all traffic control devices (including signs, signals, and markings) and other controls (including adult crossing guards, student patrols, and grade-separated crossings) required for the special pedestrian conditions in school areas.**

**Option:**

In-roadway signs for school traffic control areas may be used consistent with the requirements of Sections 2B.12, 7B.08, and 7B.09.

**Support:**

Requirements discussed in Chapter 2A and Section 2B.05 are applicable in school areas.

**Section 7A.05 Application of Standards****Support:**

Sections 1A.02 and 1A.07 contain information regarding the application of standards.

**Section 7A.06 Engineering Study Required****Support:**

Section 1A.09 contains information regarding engineering studies.

**Section 7A.07 Maintenance of Traffic Control Devices****Support:**

Section 1A.05 contains information regarding the maintenance of traffic control devices.

**Section 7A.08 Placement Authority****Support:**

Section 1A.08 contains information regarding placement authority for traffic control devices.

**Section 7A.09 Unauthorized Devices and Messages****Support:**

Sections 1A.01 and 1A.08 contain information regarding unauthorized devices and messages.

**Section 7A.10 Meaning of Standard, Guidance, Option, and Support****Support:**

The introduction to this Manual contains information regarding the meaning of the headings Standard, Guidance, Option, and Support, and the use of the words shall, should, and may.

## CHAPTER 7B. SIGNS

### **Section 7B.01 Size of School Signs**

#### **Standard:**

The sizes of signs and plaques to be used on conventional roadways in school areas shall be as shown in Table 7B-1.

The Conventional Road sign size shall be used on public roads, streets, and highways unless engineering judgment determines that a Minimum or Oversized sign size would be more appropriate.

The Oversized sign size shall be used on expressways.

#### **Option:**

The Oversized sign size may be used for applications that require increased emphasis, improved recognition, or increased legibility.

The Minimum sign size may be used on local residential streets, in urban areas, and where there are low traffic volumes and low vehicle speeds, as determined by engineering judgment.

### **Section 7B.02 Illumination and Reflectorization**

#### **Standard:**

The signs used for school area traffic control shall be retroreflectorized or illuminated.

### **Section 7B.03 Position of Signs**

#### **Guidance:**

Signs should be placed in positions where they will convey their messages most effectively without restricting lateral clearance or sight distances. Placement therefore should consider highway design, alignment, vehicle speed, and roadside development.

Signs should have a maximum practical clearance from the edge of the traveled way for the safety of vehicles that might leave the roadway and strike the sign supports. Except as noted in the Option, signs should not be closer than 6 ft from the edge of a paved shoulder, or if none, 12 ft from the edge of the traveled way.

#### **Option:**

In urban areas, a lesser clearance of not less than 2 ft from the face of the curb may be used. In urban areas, where sidewalk width is limited or existing poles are close to the curb, a clearance of 1 ft from the curb face may be used.

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### **Section 7B.04 Height of Signs**

#### **Support:**

Section 2A.18 contains information regarding the mounting height of signs.

### **Section 7B.05 Installation of Signs**

#### **Support:**

Section 2A.16 contains information regarding the installation of signs.

### **Section 7B.06 Lettering**

#### **Support:**

The Federal Highway Administration's "Standard Highway Signs" book (see Section 1A.11) contains information regarding sign lettering.

**Section 7B.07 Sign Color for School Warning Signs****Standard:**

All school warning signs, in addition to the following signs, shall have a fluorescent yellow-green background with a black legend and border:

- A. School Advance Warning sign (S1-1);
- B. SCHOOL BUS STOP AHEAD sign (S3-1);
- C. SCHOOL plaque (S4-3);
- D. The "SCHOOL" portion of the School Speed Limit sign (S5-1);
- E. XXX FEET plaque (W16-2 series);
- F. AHEAD plaque (W16-9p);
- G. Diagonal Arrow plaque (W16-7p); and
- H. Reduced Speed School Zone Ahead sign (S4-5, S4-5a).

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**Guidance:**

When the fluorescent yellow-green background color is used, a systematic approach featuring one background color within a zone or area should be used. The mixing of standard yellow and fluorescent yellow-green backgrounds within a zone or area should be avoided.

In general, the fluorescent yellow-green background color should be used for all warning signs pertaining to the School Zone within the School Zone and approaching the School Zone. This includes the area starting with the first School Advance Warning Assembly and ending with the END SCHOOL ZONE (S5-2) regulatory sign, which should be white with a black legend.

In situations where non-School Zone warning signs are located within a School Zone, the non-School Zone warning signs should be yellow with a black legend.

If a pedestrian crossing is located within a School Zone, but is not part of an established route to school, the warning signs for that crossing should be yellow with a black legend.

**Section 7B.08 School Advance Warning Assembly (S1-1 with Supplemental Plaque)****Guidance:**

The School Advance Warning assembly (see Figure 7B-1) should be installed in advance of locations where school buildings or grounds are adjacent to the highway, except where a physical barrier such as fencing separates school children from the highway.

**Standard:**

**The School Advance Warning assembly shall be used in advance of any installation of the School Crosswalk Warning assembly (see Figure 7B-2), or in advance of the first installation of the School Speed Limit assembly (see Figure 7B-3).**

**If used, the School Advance Warning assembly shall be installed not less than 150 ft nor more than 700 ft in advance of the school grounds or school crossings.**

**If used, the School Advance Warning assembly shall consist of a School Advance Warning (S1-1) sign supplemented with a plaque with the legend AHEAD (W16-9p) or XXX FEET (W16-2 or W16-2a) to provide advance notice to road users of crossing activity.**

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**Option:**

A 12 in reduced size in-street School Advance Warning (S1-1) sign (see Figure 7B-4), installed in compliance with the mounting height and breakaway requirements for In-Street Pedestrian Crossing (R1-6 or R1-6a) signs (see Section 2B.12), may be used in advance of a school crossing to supplement the ground-mounted school warning signs. A 12 x 6 in reduced size AHEAD (W16-9p) plaque may be mounted below the reduced size in-street School Advance Warning (S1-1) sign. These reduced size signs may only be used when approved by the Chief Traffic Engineer or a designee.

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If the School Advance Warning Assembly or SCHOOL BUS STOP AHEAD (S3-1) sign have been considered but deemed inappropriate, a SCHOOL CHILDREN WALK ALONG THIS ROAD (S3-1-DE) sign (see Figure 7B-1) may be installed only in special circumstances where the Chief Traffic Engineer or a designee has determined such warning would be necessary.

**Table 7B-1. Size of School Area Signs and Plaques**

Sign	DeIDOT MUTCD Code	Section	Conventional Road	Minimum	Oversized
School Advance Warning	S1-1	7B.08	900 x 900 mm (36 x 36 in)	750 x 750 mm (30 x 30 in)	1200 x 1200 mm (48 x 48 in)
School Bus Stop Ahead	S3-1	7B.10	750 x 750 mm (30 x 30 in)	---	900 x 900 mm (36 x 36 in)
School Children Walk Along This Road	S3-1-DE	7B.08	750 x 750 mm (30 x 30 in)	---	900 x 900 mm (36 x 36 in)
Reduced Speed School Zone Ahead	S4-5, S4-5a	7B.12	900 x 900 mm (36 x 36 in)	750 x 750 mm (30 x 30 in)	1200 x 1200 mm (48 x 48 in)
School Speed Limit XX When Children Are Present	S5-1-DE	7B.11	600 x 1350 mm (24 x 54 in)	---	900 x 2100 mm (36 x 84 in)
End School Zone	S5-2	7B.13	600 x 750 mm (24 x 30 in)	---	900 x 1200 mm (36 x 48 in)
Delaware Drug Free School Zone	S5-2-DE	7B.13	450 x 450 mm (18 x 18 in)	---	---
School Speed XX Limit When Flashing (Overhead Use Only)	S5-3-DE	7B.11	1525 x 1065 mm (60 in x 42 in)	---	---
Speed Limit (School Use) (English)	R2-1	7B.11	600 x 750 mm (24 x 30 in)	---	900 x 1200 mm (36 x 48 in)
Yield Here to Pedestrians	R1-5L,5R	2B.11	450 x 450 mm (18 x 18 in)	---	---
In-Street Pedestrian Crossing	R1-6, R1-6a	7B.09	300 x 900 mm (12 x 36 in)	---	---

Plaque	DeIDOT MUTCD Code	Section	Conventional Road	Minimum	Oversized
School Bus Stop Ahead	S3-1p-DE	7B.10	600 x 450 mm (24 x 18 in)	---	750 x 600 mm (30 x 24 in)
X:XX to X:XX AM X:XX to X:XX PM	S4-1	7B.11	600 x 250 mm (24 x 10 in)	---	900 x 450 mm (36 x 18 in)
When Children Are Present	S4-2	7B.11	600 x 250 mm (24 x 10 in)	---	900 x 450 mm (36 x 18 in)
School	S4-3	7B.11	600 x 200 mm (24 x 8 in)	---	900 x 300 mm (36 x 12 in)
When Flashing	S4-4	7B.11	600 x 250 mm (24 x 10 in)	---	900 x 450 mm (36 x 18 in)
Mon-Fri	S4-6	7B.11	600 x 250 mm (24 x 10 in)	---	900 x 450 mm (36 x 18 in)
XXX Feet	W16-2	7B.08	600 x 450 mm (24 x 18 in)	---	750 x 600 mm (30 x 24 in)
XXX Ft	W16-2a	7B.08	600 x 300 mm (24 x 12 in)	---	750 x 450 mm (30 x 18 in)
Diagonal Arrow	W16-7p	7B.09	600 x 300 mm (24 x 12 in)	---	750 x 450 mm (30 x 18 in)
Diagonal Arrow (Optional Size)	W16-7p	7B.09	525 x 375 mm (21 x 15 in)	---	---
Ahead	W16-9p	7B.08	600 x 300 mm (24 x 12 in)	---	750 x 450 mm (30 x 18 in)

**Section 7B.09 School Crosswalk Warning Assembly (S1-1 with Diagonal Arrow)****Standard:**

If used, the School Crosswalk Warning assembly (see Figure 7B-1) shall be installed at the marked crosswalk, or as close to it as possible, and shall consist of a School Advance Warning (S1-1) sign supplemented with a diagonal downward pointing arrow (W16-7p) plaque to show the location of the crossing.

The School Crosswalk Warning assembly shall not be used at marked crosswalks other than those adjacent to schools and those on established school pedestrian routes.

The School Crosswalk Warning assembly shall not be installed on approaches controlled by a STOP sign.

**Guidance:**

The School Crosswalk Warning assembly should be installed at marked crosswalk(s), including those at signalized locations, used by students going to and from school (see Figure 7B-2) as determined by an engineering study.

**Option:**

The In-Street Pedestrian Crossing (R1-6 or R1-6a) sign (see Section 2B.12) may be used at unsignalized school crossings. When used at a school crossing, a 12 x 4 in SCHOOL (S4-3) plaque (see Figure 7B-4) may be mounted above the sign.

A 12 in reduced size School Advance Warning (S1-1) sign (see Figure 7B-4) may be used at an unsignalized school crossing instead of the In-Street Pedestrian Crossing (R1-6 or R1-6a) sign. A 12 x 6 in reduced size Diagonal Arrow (W16-7p) plaque may be mounted below the reduced size in-street School Advance Warning (S1-1) sign.

**Standard:**

If an In-Street Pedestrian Crossing sign or a reduced size in-street School Advance Warning (S1-1) sign is placed in the roadway, the sign support shall comply with the mounting height and breakaway requirements for In-Street Pedestrian Crossing (R1-6 or R1-6a) signs (see Section 2B.12).

Current Delaware State Law indicates that drivers must yield to pedestrians at unsignalized intersections. The status of this law shall be confirmed with the Chief Traffic Engineer or a designee prior to installing the In-Street Pedestrian Crossing sign.

These signs shall only be used when approved by the Chief Traffic Engineer or a designee.

The STOP FOR legend shall only be used if Delaware State Law specifically requires that a driver must stop for a pedestrian in a crosswalk

The In-Street Pedestrian Crossing sign and the reduced size in-street School Advance Warning (S1-1) sign shall not be used at signalized locations.

**Section 7B.10 SCHOOL BUS STOP AHEAD Sign (S3-1)****Guidance:**

The SCHOOL BUS STOP AHEAD (S3-1) sign (see Figure 7B-1) should be installed in advance of locations where a school bus, when stopped to pick up or discharge passengers, is not visible to road users for a distance of 500 ft in advance and where there is no opportunity to relocate the bus stop to provide 500 ft of visibility.

**Option:**

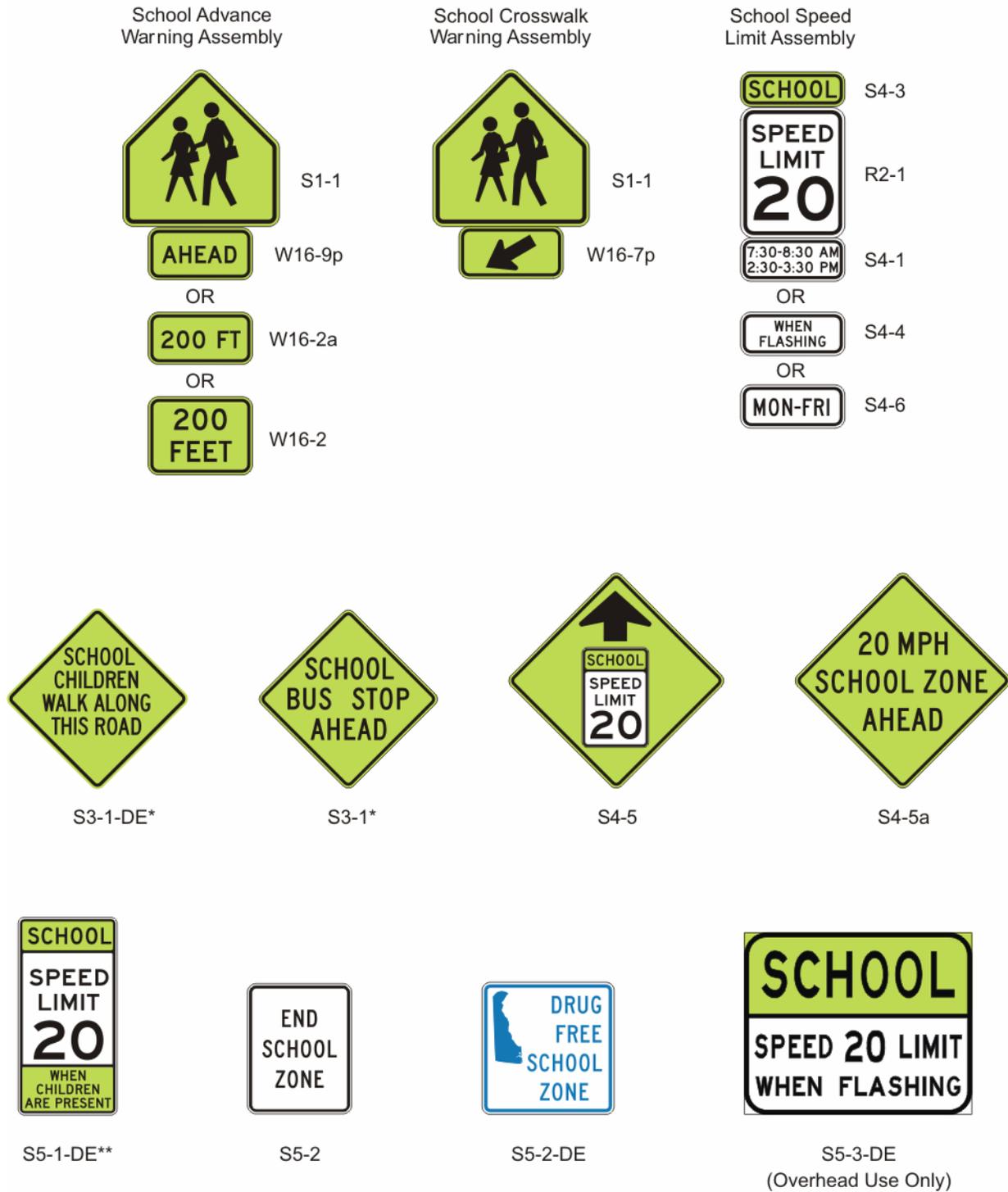
In locations where other warning sign installations are present, the SCHOOL BUS STOP AHEAD (S3-1p-DE) plaque may be used in place of the SCHOOL BUS STOP AHEAD (S3-1) sign to reduce sign clutter.

**Guidance:**

When used outside of School Zones, the School Bus Stop Ahead (S3-1) sign and the SCHOOL BUS STOP AHEAD (S3-1p-DE) plaque should be yellow with a black legend. When they are used within a School Zone, they should be fluorescent yellow-green with a black legend.

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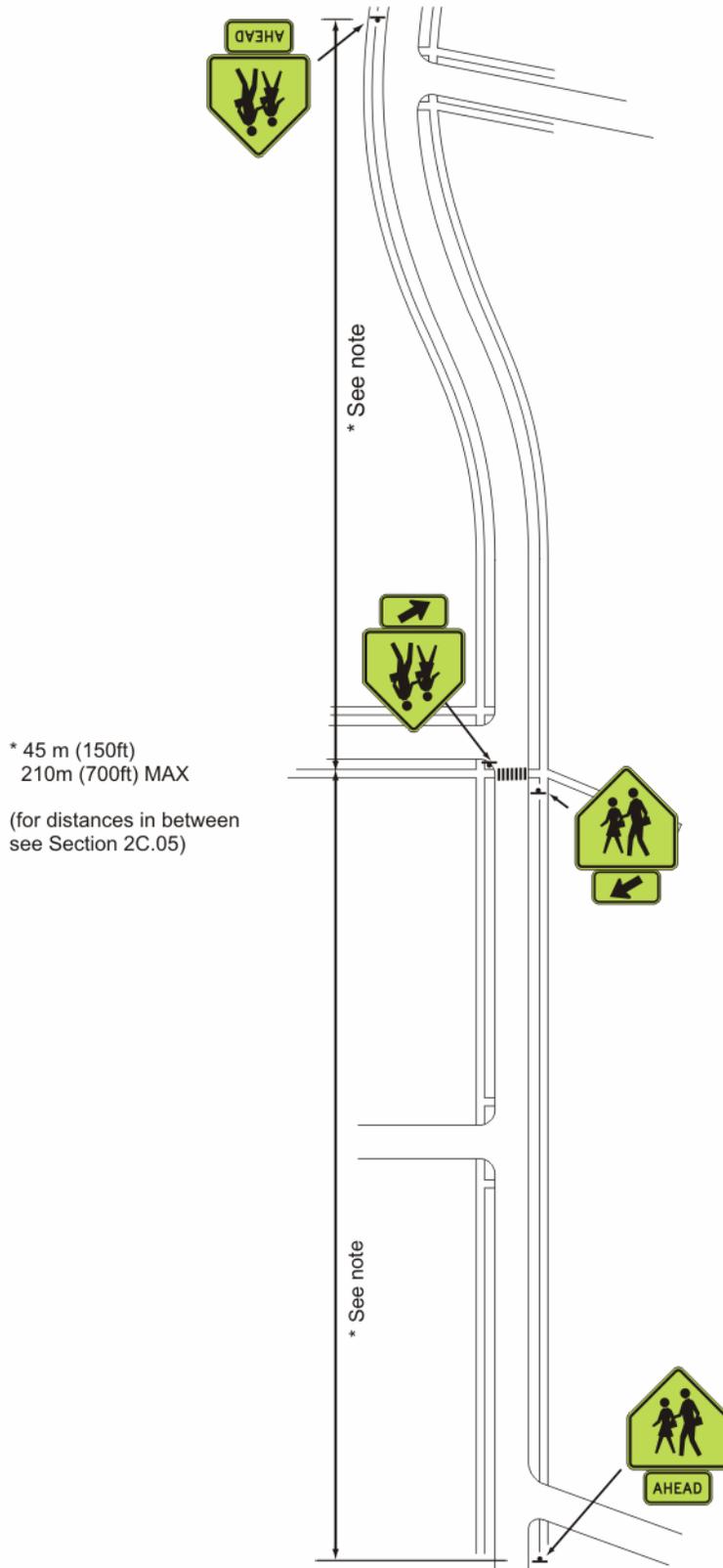
**Figure 7B-1. School Area Signs**



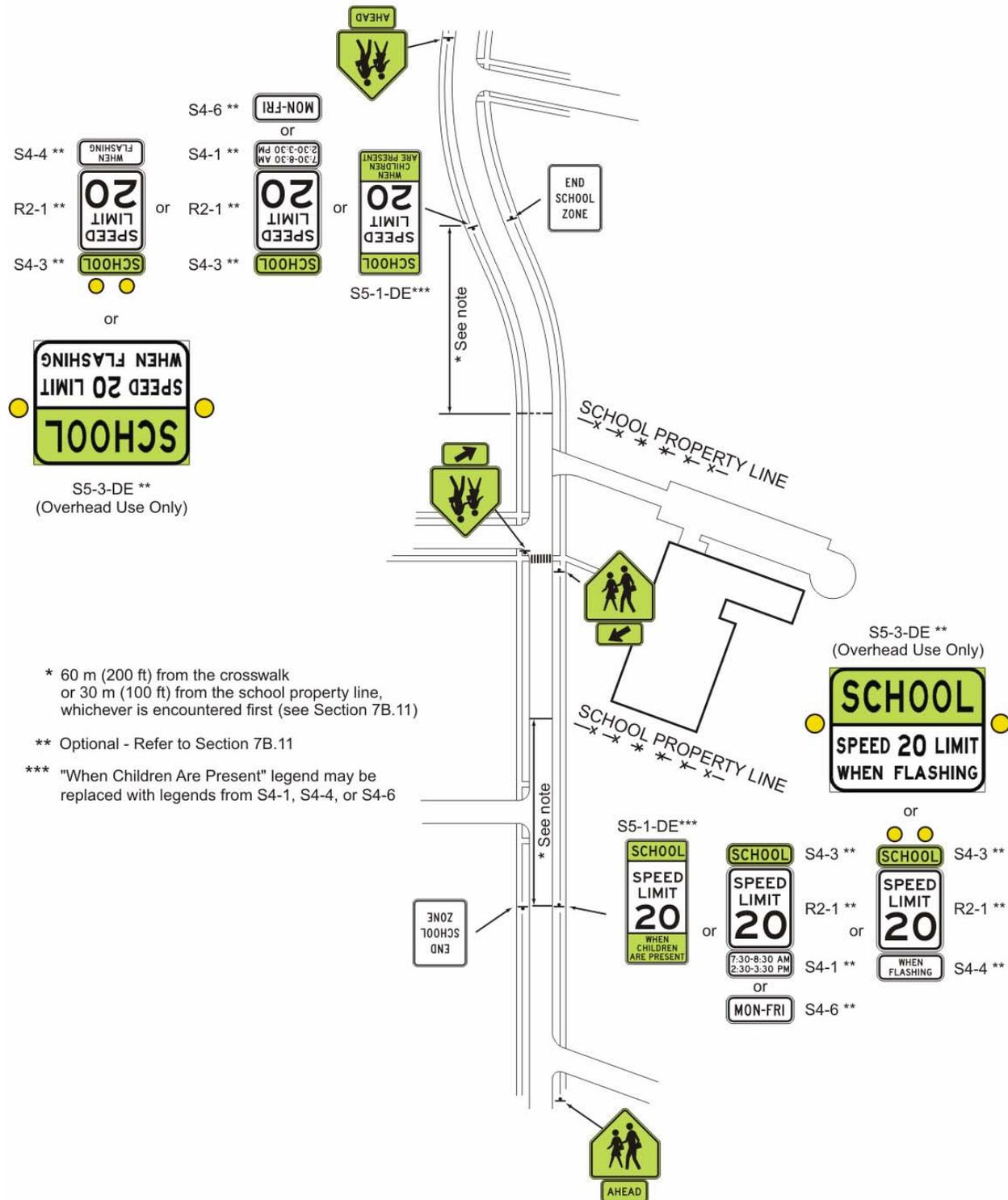
\* FYG only within school zones

\*\* "When Children Are Present" legend may be replaced with legends from S4-1, S4-4, or S4-6

**Figure 7B-2. Examples of Signing for School Crosswalk Warning Assembly**

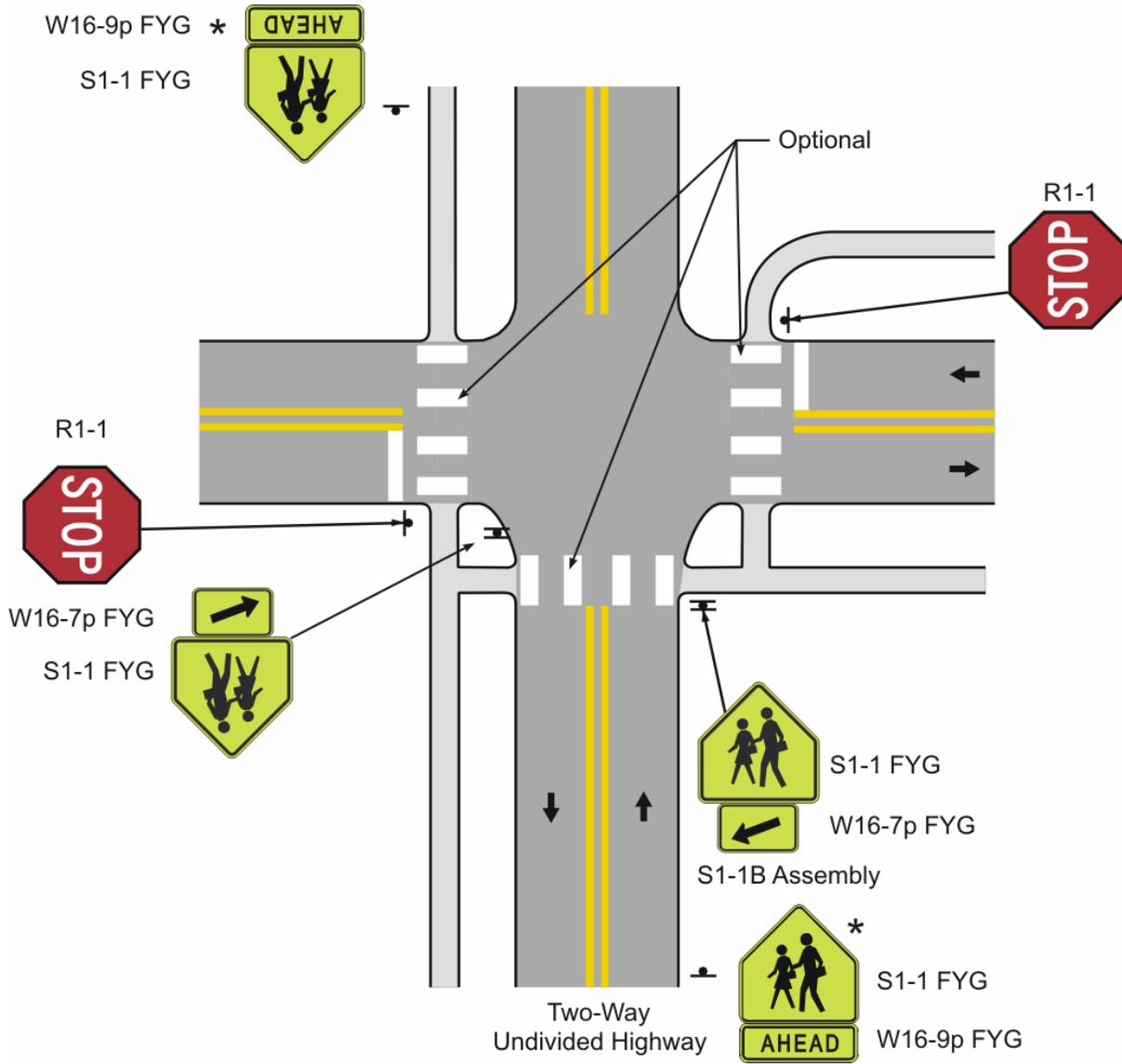


**Figure 7B-3. Examples of Signing for School Area Traffic Control with School Speed Limits**



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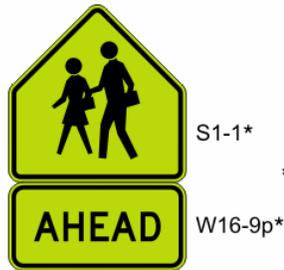
**Figure 7B-3a. Examples of School Crossing Signing Not Adjacent to School Property**  
*(DelDOT MUTCD Only)*



\* Optional Assembly

**Figure 7B-4. In-Street Signs in School Areas**

a - In advance of the school crossing

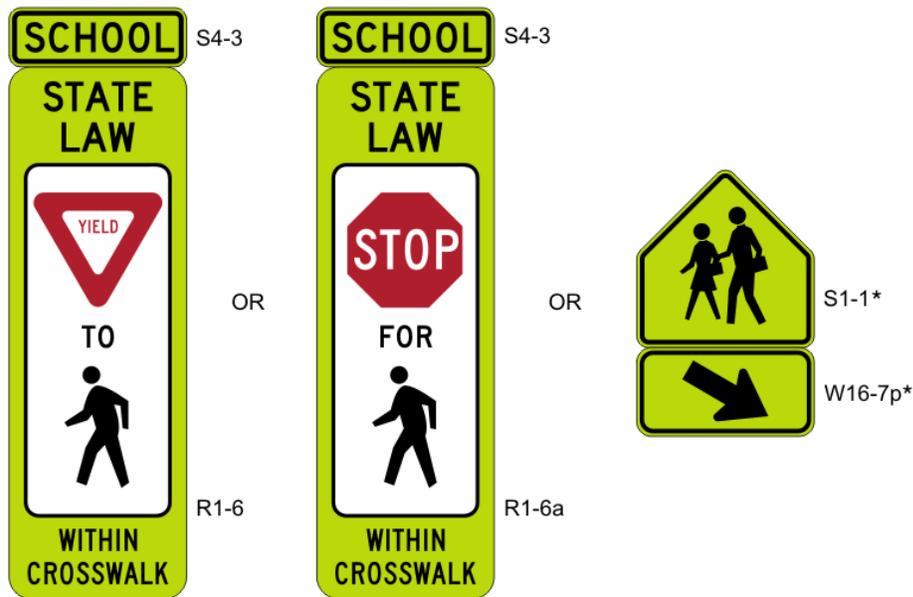


S1-1\*

W16-9p\*

\*  
Reduced size signs:  
S1-1 300 x 300 mm (12 x 12 in)  
W16-7p 300 x 150 mm (12 x 6 in)  
W16-9p 300 x 150 mm (12 x 6 in)

b - At the school crossing



**Section 7B.11 School Speed Limit Assembly (S4-1, S4-3, S4-4, S4-6, S5-1-DE)**

**Standard:**

A School Speed Limit assembly (see Figure 7B-1) or a School Speed Limit (S5-1-DE) sign (see Figure 7B-3) shall be used to indicate the speed limit where a reduced speed zone for a school area has been established (in accordance with law based upon an engineering study) or where a speed limit is specified for such areas by statute. The School Speed Limit assembly or School Speed Limit sign shall be placed at or as near as practical to the point where the reduced speed zone begins.

**Guidance:**

The reduced speed zone should begin either at a point 200 ft from the crosswalk, or at a point 100 ft from the school property line, based on whichever is encountered first as traffic approaches the school.

**Standard:**

The School Speed Limit assembly shall consist of a top plaque (S4-3) with the legend SCHOOL, a Speed Limit (R2-1) sign, and a bottom plaque (S4-1, S4-4, or S4-6) indicating the specific periods of the day and/or days of the week that the special school speed limit is in effect (see Figure 7B-1).

**Option:**

An SCHOOL SPEED LIMIT XX WHEN FLASHING sign (S5-3-DE), with Speed Limit Sign Beacons mounted to the left and right of the sign, may be mounted overhead at or as near as practicable to the point where the reduced speed zone begins (see Figure 7B-3), only if approved by the Chief Traffic Engineer or designee.

Changeable message signs that display the speed of approaching drivers (see Section 2B.13) may be used in a school speed limit zone, provided they are approved for use by the Chief Traffic Engineer or designee.

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A Speed Limit Sign Beacon also may be used, with a WHEN FLASHING legend, to identify the periods that the school speed limit is in effect. The lenses of the Speed Limit Sign Beacon may be positioned above or within the face of the School Speed Limit (S5-1) sign (see Figure 7B-1). The lenses of the Speed Limit Sign Beacon may be positioned above the face of the SCHOOL (S4-3) plaque in a School Speed Limit Assembly that also contains a Speed Limit (R2-1) sign and a WHEN FLASHING (S4-4) plaque (see Figure 7B-3).

A FINES HIGHER (R2-6) plaque (see Section 2B.17) may be used to advise road users when increased fines are imposed for traffic violations in school zones. Current Delaware Law does not allow increased fines in School Zones. The status of this law shall be confirmed with the Chief Traffic Engineer or a designee prior to installing the FINES HIGHER sign. The FINES HIGHER plaque shall only be used if Delaware State Law allows increased fines to be administered in School Zones.

**Section 7B.12 Reduced Speed School Zone Ahead Sign (S4-5, S4-5a)****Option:**

The Reduced Speed School Zone Ahead (S4-5, S4-5a) sign (see Figure 7B-1) may be used to inform road users of a reduced speed zone when engineering judgment indicates that advance notice would be appropriate.

**Standard:**

**If used, the Reduced Speed School Zone Ahead sign shall be followed by a School Speed Limit sign or a School Speed Limit assembly.**

**The speed limit displayed on the Reduced Speed School Zone Ahead sign shall be identical to the speed limit displayed on the subsequent School Speed Limit sign or School Speed Limit assembly.**

**Guidance:**

In Delaware, as specified in the Delaware Code (Title 21, Chapter 41, Subchapter VIII, §4169), the speed limit within a School Zone shall be 20 mph where 20 mph regulatory signs are in effect during specific periods. While 20 mph is the minimum speed limit within a school zone, there may be mitigating circumstances that warrant a higher limit. The appropriate speed limit should be established in accordance with the results of a traffic engineering study.

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**Section 7B.13 END SCHOOL ZONE Sign (S5-2)****Standard:**

**The end of an authorized and posted school speed zone shall be marked with a standard Speed Limit sign showing the speed limit for the section of highway that follows or with an END SCHOOL ZONE (S5-2) sign (see Figure 7B-1).**

**Guidance:**

In the State of Delaware, the END SCHOOL ZONE (S5-2) sign should be used to designate the end of the school zone in lieu of the regulatory speed limit sign.

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**Section 7B.14 Parking and Stopping Signs (R7 and R8 Series)****Option:**

Parking and stopping regulatory signs may be used to prevent parked or waiting vehicles from blocking pedestrians' views, and drivers' views of pedestrians, and to control vehicles as a part of the school traffic plan.

**Support:**

Parking signs and other signs governing the stopping and standing of vehicles in school areas cover a wide variety of regulations. Typical examples of regulations are as follows:

- A. No Parking X:XX AM to X:XX PM School Days Only;
- B. No Stopping X:XX AM to X:XX PM School Days Only;
- C. X Min Loading X:XX AM to X:XX PM School Days Only; and
- D. No Standing X:XX AM to X:XX PM School Days Only.

Sections 2B.39, 2B.40, and 2B.41 contain information regarding the signing of parking regulations in school zone areas.

**Section 7B.15 DRUG FREE SCHOOL ZONE Sign (S5-2-DE)**

**Standard:**

**A Drug-Free School Zone shall be marked with a DRUG FREE SCHOOL ZONE (S5-2-DE) sign as near as practicable to the point at which the roadway crosses into the zone.**

**Support:**

In Delaware, as specified in the Delaware Code (Title 16, Chapter 47, Subchapter IV, §4767), the distribution, delivery, or possession of a controlled substance within 1,000 feet of school property is a felony.

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## CHAPTER 7C. MARKINGS

### Section 7C.01 Functions and Limitations

Support:

Markings have definite and important functions in a proper scheme of school area traffic control. In some cases, they are used to supplement the regulations or warnings provided by other devices, such as traffic signs or signals. In other instances, they are used alone and produce results that cannot be obtained by the use of any other device. In such cases they serve as an effective means of conveying certain regulations, guidance, and warnings that could not otherwise be made clearly understandable.

Pavement markings have limitations. They might be obliterated by snow, might not be clearly visible when wet, and might not be durable when subjected to heavy traffic. In spite of these limitations, they have the advantage, under favorable conditions, of conveying warnings or information to the road user without diverting attention from the road.

### Section 7C.02 Standardization of Application

**Standard:**

**Each standard marking shall be used only to convey the meaning prescribed for it in this Manual.**

### Section 7C.03 Crosswalk Markings

Support:

Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops.

Crosswalk markings also serve to alert road users of a pedestrian crossing point across roadways not controlled by highway traffic signals or STOP signs.

At non-intersection locations, crosswalk markings legally establish the crosswalk.

**Standard:**

**When crosswalk markings are used, they shall consist of 600 mm (24 in) wide solid white longitudinal lines spaced at 600 mm (24 in) apart and placed parallel to the travel lanes to avoid the wheel paths. They shall not be less than 1.8 m (6 ft) in length (see Figure 3B-16).**

Guidance:

Crosswalks should be marked at all intersections on established routes to school where there is substantial conflict between motorists, bicyclists, and pedestrian movements, where students are encouraged to cross between intersections, or where students would not otherwise recognize the proper place to cross (see Figure 7A-1).

Crosswalk lines should not be used indiscriminately. An engineering study should be performed before they are installed at locations away from traffic control signals or STOP signs.

Crosswalk markings should extend across the full width of pavement or to the edge of the intersecting crosswalk to discourage diagonal walking between crosswalks (see Figures 3B-15 and 3B-16).

Crosswalks should be marked at all intersections where there is substantial conflict between vehicular and pedestrian movements.

Option:

When patterned pavement or other similar treatments are used to depict crosswalks, 300 mm (12 in) solid white lines may be used to define the crosswalk.

### Section 7C.04 Stop and Yield Lines

**Standard:**

**If used, 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.**

**If used, yield lines (see Figure 3B-14) 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.**

**Stop lines shall be placed on all approaches to signalized intersections.**

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**Guidance:**

Stop lines should be 400 mm (16 in) wide.

Stop lines should be used to indicate the point behind which vehicles are required to stop, in compliance with a STOP (R1-1) sign, traffic control signal, or some other traffic control device, except YIELD signs.

Stop lines should be placed on the STOP-controlled approaches of unsignalized intersections of two state-maintained roadways.

The individual triangles comprising a yield line should typically have a base of 600 mm (24 in) wide and a height equal to 1.5 times the base. The space between the triangles should be 300 mm (12 in).

**Guidance:**

Yield lines should not be used for a right-turn lane that also has a YIELD sign and crosswalk markings.

**Option:**

Yield lines may be used to indicate the point behind which vehicles are required to yield in compliance with a YIELD (R1-2) sign or a Yield Here to Pedestrians (R1-5) sign.

**Guidance:**

If used, stop and yield lines should be placed a minimum of 1.2 m (4 ft) in advance of the nearest crosswalk line at controlled intersections, except for yield lines at roundabout intersections as provided for in Section 3B.24 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 be placed no more than 9m (30 ft) nor less than 1.2 m (4 ft) from the nearest edge of the intersecting traveled way. Stop lines should be placed to allow sufficient sight distance to all other approaches to an intersection. When necessary to add emphasis to a YIELD sign or to mark the location where a stop might be made in compliance with a motorist's responsibility at a YIELD sign, a YIELD line should be used.

**Option:**

Yield lines may be used at the approach to the second roadway of a divided highway or entrance to a roundabout (see Figure 3B-16A).

**Guidance:**

If used at an unsignalized midblock crosswalk, yield lines should be placed adjacent to the Yield Here to Pedestrians sign located 6.1 to 15 m (20 to 50 ft) in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield line and the crosswalk (see Figure 3B-15).

Stop lines at midblock signalized locations should be placed at least 12 m (40 ft) in advance of the nearest signal indication (see Section 4D.15).

**Support:**

Drivers who yield too close to crosswalks on multi-lane approaches place pedestrians at risk by blocking other drivers' views of pedestrians.

**Section 7C.05 Curb Markings for Parking Regulations****Standard:**

**Signs shall be used with curb markings in those areas where curb markings are frequently obliterated by snow and ice accumulation, unless the no parking zone is controlled by statute or local ordinance.**

**In the State of Delaware, DelDOT does not install or maintain curb markings. If municipalities or private property owners, including schools, opt to install curb markings on facilities within their property limits, the installation and maintenance of such markings shall be at their expense.**

**Guidance:**

When curb markings are used without signs to convey parking regulations, a legible word marking regarding the regulation (such as "No Parking" or "No Standing") should be placed on the curb.

**Option:**

Local highway agencies may prescribe special colors for curb markings to supplement standard signs for parking regulation.

**Support:**

Since yellow and white curb markings are frequently used for curb delineation and visibility, it is advisable to establish parking regulations through the installation of standard signs (see Sections 2B.39 through 2B.41).

**Section 7C.06 Pavement Word and Symbol Markings****Support:**

Word and symbol markings on the pavement are used for the purpose of guiding, warning, or regulating traffic. Symbol messages are preferable to word messages.

**Standard:**

**Word and symbol markings shall be white. Word and symbol markings shall not be used for mandatory messages except in support of standard signs.**

**Guidance:**

Letters and numerals should be 6 ft or more in height. All letters, numerals, and symbols should be in accordance with the Federal Highway Administration's "Standard Highway Signs" book (see Section 1A.11).

Word and symbol markings should not exceed three lines of information.

If a pavement marking word message consists of more than one line of information, it should read in the direction of travel. The first word of the message should be nearest to the road user.

The longitudinal space between word or symbol message markings, including arrow markings, should be at least four times the height of the characters for low speed roads, but not more than ten times the height of the characters under any conditions.

The number of different word and symbol markings used should be minimized to provide effective guidance and avoid misunderstanding.

Except as noted in the Option below, pavement word and symbol markings should be no more than one lane in width.

**Option:**

The SCHOOL word marking may extend to the width of two approach lanes (see Figure 7C-1).

**Standard:**

**Pavement word and symbol markings shall not extend into the opposing direction travel lane.**

**Guidance:**

If the two-lane SCHOOL word marking is used, the letters should be 10 ft or more in height.

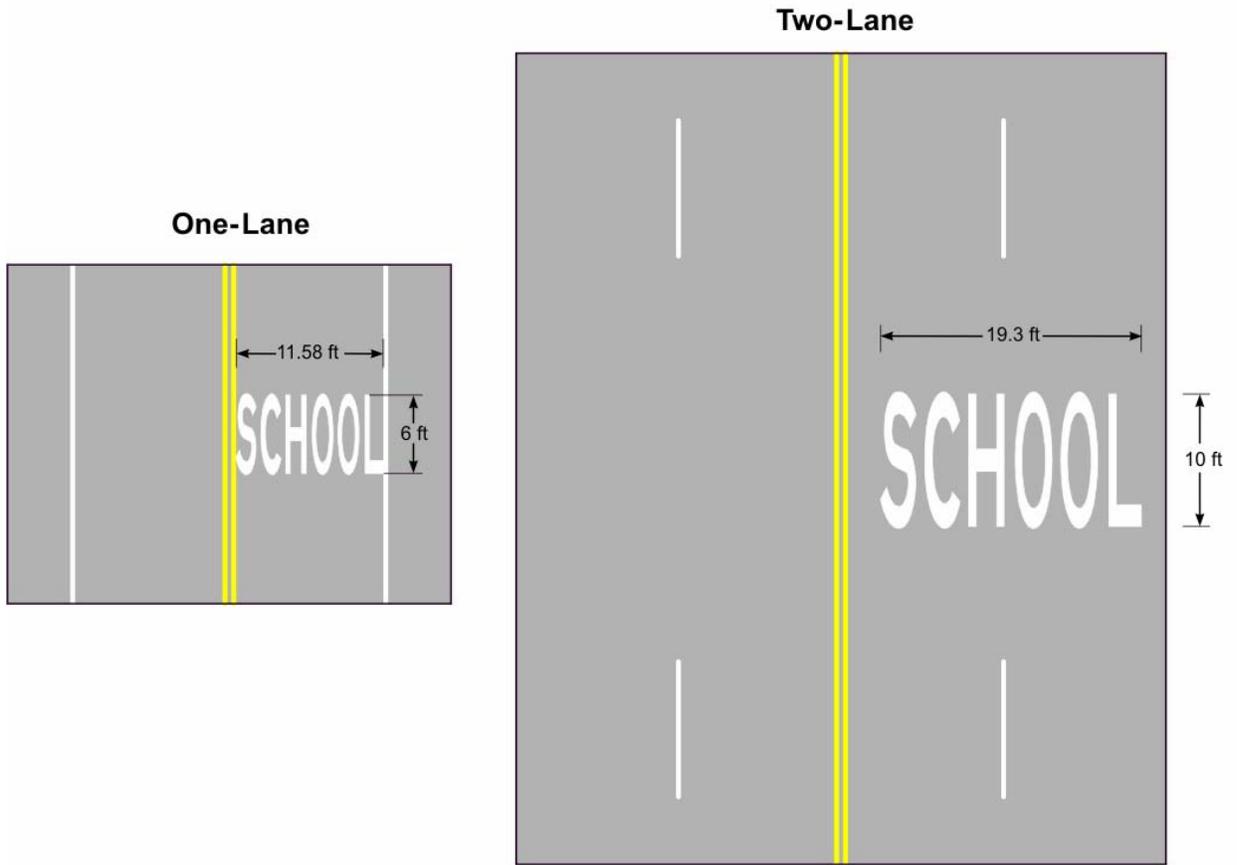
Pavement word and symbol markings should be proportionally scaled to fit within the width of the lane upon which they are applied.

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**Figure 7C-1. One & Two-Lane Pavement Marking of "SCHOOL"**



## CHAPTER 7D. SIGNALS

### Section 7D.01 General

Support:

Part 4 contains information regarding highway traffic signals in school areas. The School Crossing signal warrant is described in Section 4C.06.

### Section 7D.02 Flashing Beacons at School Crossings

Option:

Flashing yellow beacons may be installed to supplement standard school signing and markings for the purpose of providing advanced warning during specified times of operation when justified.

A flashing yellow beacon may be justified when ALL of the following conditions are fulfilled:

1. At least 40 school pedestrians use the crossing during each of any two hours (not necessarily consecutive) of a normal school day;
2. The crossing is at least 180 m (600 ft) from the nearest alternate crossing controlled by traffic signals, stop signs or crossing guards;
3. The vehicular volume through the crossing exceeds 200 vehicles per hour in urban areas or 140 vehicles per hour in rural areas during the same hour the students are going to and from school during normal school hours; and
4. The critical approach speeds exceeds 55 km/h (35 mph) or the approach visibility is less than the stopping sight distance.

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## **CHAPTER 7E. CROSSING SUPERVISION**

### **Section 7E.01 Types of Crossing Supervision**

Support:

There are two types of school crossing supervision:

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

Information for the organization, operation, and administration of an adult crossing guard program are given in “Civilian Guards For School Crossings” (available from the Center for Public Safety of Northwestern University, 405 Church Street, Evanston, IL 60204) and “Adult School Crossing Guards” (available from the American Automobile Association, 1000 AAA Drive, Heathrow, FL 32746).

Information for the organization, administration and operation of a student patrol program are given in “Policies and Practices for School Safety Patrols” (available from the American Automobile Association, 1000 AAA Drive, Heathrow, FL 32746).

### **Section 7E.02 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 need to be created (see Section 7A.03), and where authorized by law.

Guidance:

Adult crossing guards should assist school children crossing the streets or assist platoons of vehicles entering or exiting the school.

The Delaware Department of Transportation should not arrange funding for adult crossing guards.

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### **Section 7E.03 Qualifications of Adult Crossing Guards**

Support:

High standards for selection of adult crossing guards are essential.

Guidance:

Adult crossing guards should possess the following qualifications:

- A. Average intelligence;
- B. Good physical condition, including sight, hearing, and mobility;
- C. Mental alertness;
- D. Neat appearance;
- E. Good character;
- F. Dependability; and
- G. Sense of responsibility for safety of students.

Adult crossing guards should be either police officers or other adults who are trained and supervised by local law enforcement agencies. This training should entail instruction on effective verbal and non-verbal communication skills, appropriate uniform, and proper traffic control procedures.

Adult crossing guards should understand how to effectively control traffic, balancing the demands of all conflicting movements.

Adult crossing guards should be aware of the impact their control can have on the flow of traffic on the main road.

Adult crossing guards should pick opportune times to create a safe gap, and should not keep traffic stopped on the main road for an unreasonable length of time.

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### **Section 7E.04 Uniform of Adult Crossing Guards and Student Patrols**

Guidance:

Adult crossing guards should be uniformed so that road users and pedestrians can recognize them and respond to their signals. The uniforms should be distinctively different from those worn by regular law enforcement officers.

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**Adult crossing guards shall wear high-visibility retroreflective safety apparel labeled, at minimum, as ANSI 107-2004 standard performance for Class 2 as described in Section 6E.02.**

**Student patrols shall wear high-visibility retroreflective safety apparel labeled, at minimum, as ANSI 107-2004 standard performance for Class 1 as described in Section 6E.02.**

## Guidance:

Law enforcement officers should wear high-visibility retroreflective material over their uniforms when directing nighttime operations.

**Section 7E.05 Operating Procedures for Adult Crossing Guards**

## Guidance:

Adult crossing guards should not direct traffic in the usual law enforcement regulatory sense. In the control of traffic, they should pick opportune times to create a reasonably safe gap. At these times, they should 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 should use a STOP paddle. The STOP paddle should be the primary hand-signaling device.

**Standard:**DelDOT  
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**The STOP paddle shall be an octagonal shape. The background of the STOP face shall be red with at least 6 in series capital white letters and border. The paddle shall be at least 18 in 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 red or white flashing lights on both sides of the paddle. The red or white flashing lights may be arranged in any of the following patterns:

- A. Two red or white lights centered vertically above and below the STOP legend;
- B. Two red or white lights centered horizontally on each side of the STOP legend;
- C. One red or white light centered below the STOP legend;
- D. A series of eight or more small red or white lights no larger than 0.25 inches in diameter 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.

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Rev.**Standard:**

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

**Section 7E.06 Uniformed Law Enforcement Officers**

## Option:

Uniformed law enforcement officers may be used for school crossing supervision.

**Section 7E.07 Student Patrols**

## Option:

Students patrols may be used to direct and control pedestrians at crossings near schools where adequate gaps in traffic occur frequently enough so that gaps do not need to be created.

Student patrols may be used to direct and control pedestrians at signalized intersections where turning movements are not a significant problem, and may be used to assist adult crossing guards in the control of pedestrians at crossing locations used by large numbers of pedestrians.

## Guidance:

Student patrols should not be responsible for directing vehicular traffic. They should not function as uniformed law enforcement officers or adult crossing guards.

**Section 7E.08 Choice of Student Patrols**

Guidance:

Student patrols should be carefully selected. They should be students from the fifth grade or higher. Leadership and reliability should be determining qualities for patrol membership.

Parental approval should be obtained in writing before a student is used as a member of a student patrol.

**Section 7E.09 Operating Procedures for Student Patrols**

Guidance:

Student patrols should use a flagging device to stop pedestrians behind the curb or edge of the roadway, and should allow them to cross only when there is an adequate gap in traffic.

**Standard:**

**Flagging devices used during periods of twilight or darkness shall be retroreflective or illuminated. Because they are not authorized to direct vehicular traffic, student patrols shall not use a STOP paddle.**

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## CHAPTER 7F. GRADE-SEPARATED CROSSINGS

### Section 7F.01 Function

Option:

Grade-separated crossings may be used to physically separate the crossing of school pedestrian traffic and vehicular flow.

### Section 7F.02 Types of Grade-Separated Crossings

Option:

Grade-separated crossings may be either overpasses over the highway or underpasses under the highway.

Guidance:

The design should follow the guidelines given in the published policies of the American Association of State Highway and Transportation Officials, such as “A Policy on Geometric Design of Highways and Streets” (see Section 1A.11).

**Standard:**

**The design of grade separated crossings shall also follow the requirements specified in the Americans with Disabilities Act (ADA). This requirement often results in significant impacts to adjacent right-of-way, and can add significant expense to a project.**

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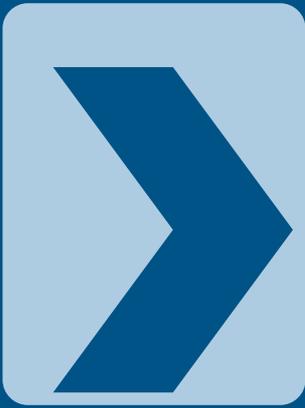
Support:

Experience has shown that overpasses are more satisfactory than underpasses for pedestrian crossings, as overpasses are easier to maintain and supervise.

### Section 7F.03 Criteria for Use of Grade-Separated Crossings

Guidance:

If use of the grade separation will be less convenient to pedestrians than an at-grade crossing, barriers or supervision should be considered to assure a satisfactory level of use.



Delaware Department of Transportation  
**Manual on Uniform Traffic  
Control Devices (MUTCD)**  
for Streets and Highways

**PART 8**  
**TRAFFIC CONTROLS FOR  
HIGHWAY-RAIL GRADE  
CROSSINGS**





<u>Legend</u>
DeIDOT Revision

## PART 8. TRAFFIC CONTROLS FOR HIGHWAY-RAIL GRADE CROSSINGS

### TABLE OF CONTENTS

		<u>Page</u>
<b>CHAPTER 8A.</b>	<b>GENERAL</b>	
Section 8A.01	Introduction .....	8A-1
Section 8A.02	Use of Standard Devices, Systems, and Practices.....	8A-3
Section 8A.03	Uniform Provisions.....	8A-3
Section 8A.04	Highway-Rail Grade Crossing Elimination .....	8A-3
Section 8A.05	Temporary Traffic Control Zones.....	8A-4
<b>CHAPTER 8B.</b>	<b>SIGNS AND MARKING</b>	
Section 8B.01	Purpose .....	8B-1
Section 8B.02	Sizes of Grade Crossing Signs.....	8B-1
Section 8B.03	Highway-Rail Grade Crossing (Crossbuck) Sign (R15-1) and Number of Tracks Sign (R15-2) .....	8B-1
Section 8B.04	Highway-Rail Grade Crossing Advance Warning Signs (W10 Series) .....	8B-4
Section 8B.05	EXEMPT Highway-Rail Grade Crossing Signs (R15-3, W10-1a).....	8B-5
Section 8B.06	Turn Restrictions During Preemption.....	8B-5
Section 8B.07	DO NOT STOP ON TRACKS Sign (R8-8) .....	8B-5
Section 8B.08	STOP (R1-1) or YIELD (R1-2) Signs at Highway-Rail Grade Crossings.....	8B-6
Section 8B.09	TRACKS OUT OF SERVICE Sign (R8-9).....	8B-7
Section 8B.10	STOP HERE WHEN FLASHING Sign (R8-10).....	8B-7
Section 8B.11	STOP HERE ON RED Sign (R10-6).....	8B-7
Section 8B.12	Emergency Notification Sign (I-13 or I-13a).....	8B-7
Section 8B.13	TRAINS MAY EXCEED 130 km/h (80 MPH) Sign (W10-8).....	8B-7
Section 8B.14	NO TRAIN HORN Sign (W10-9) .....	8B-8
Section 8B.15	NO SIGNAL Sign (W10-10) or NO GATES OR LIGHTS Sign (W10-13).....	8B-8
Section 8B.16	LOOK Sign (R15-8) .....	8B-8
Section 8B.17	Low Ground Clearance Highway-Rail Grade Crossing Sign (W10-5).....	8B-8
Section 8B.18	Storage Space Signs (W10-11, W10-11a, W10-11b) .....	8B-9
Section 8B.19	Skewed Crossing Sign (W10-12).....	8B-10
Section 8B.20	Pavement Markings .....	8B-10
Section 8B.21	Stop Lines .....	8B-10
Section 8B.22	Dynamic Envelope Markings .....	8B-10
<b>CHAPTER 8C.</b>	<b>ILLUMINATION</b>	
Section 8C.01	Illumination at Highway-Rail Grade Crossings.....	8C-1
<b>CHAPTER 8D.</b>	<b>FLASHING-LIGHT SIGNALS, GATES, AND TRAFFIC CONTROL SIGNALS</b>	
Section 8D.01	Introduction .....	8D-1
Section 8D.02	Flashing-Light Signals, Post-Mounted .....	8D-1
Section 8D.03	Flashing-Light Signals, Overhead Structures .....	8D-3
Section 8D.04	Automatic Gates .....	8D-3
Section 8D.05	Four-Quadrant Gate Systems.....	8D-4
Section 8D.06	Train Detection .....	8D-6
Section 8D.07	Traffic Control Signals at or Near Highway-Rail Grade Crossings.....	8D-6

**FIGURES**

**CHAPTER 8A.**

**GENERAL**

Figure 8A-1 Train Dynamic Envelope ..... 8A-2

**CHAPTER 8B.**

**SIGNS AND MARKINGS**

Figure 8B-1 Highway-Rail Grade Crossing (Crossbuck) Regulatory Signs ..... 8B-4

Figure 8B-2 Advance Warning Signs ..... 8B-5

Figure 8B-3 Regulatory Signs..... 8B-6

Figure 8B-4 Examples of Emergency Notification Signs ..... 8B-8

Figure 8B-5 Warning Signs ..... 8B-9

Figure 8B-6 Example of Placement of Warning Signs and Pavement Markings  
at Highway-Rail Grade Crossings ..... 8B-11

Figure 8B-7 Examples of Highway-Rail Grade Crossing Pavement Markings ..... 8B-12

Figure 8B-8 Typical Train Dynamic Envelope Pavement Markings ..... 8B-13

**CHAPTER 8D.**

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

Figure 8D-1 Composite Drawing of Active Traffic Control Devices for  
Highway-Rail Grade Crossings Showing Clearances ..... 8D-2

Figure 8D-2 Example of Location Plan for Flashing-Light Signals and  
Four-Quadrant Gates ..... 8D-5

**TABLES**

**CHAPTER 8B.**

**SIGNS AND MARKINGS**

Table 8B-1 Sign Sizes for Grade Crossing Signs ..... 8B-2

## CHAPTER 8A. GENERAL

### Section 8A.01 Introduction

Support:

Traffic control for highway-rail grade crossings includes all signs, signals, markings, other warning devices, and their supports along highways approaching and at highway-rail grade crossings. The function of this traffic control is to permit reasonably safe and efficient operation of both rail and highway traffic at highway-rail grade crossings.

For purposes of installation, operation, and maintenance of traffic control devices at highway-rail 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 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 highway-rail grade crossing.

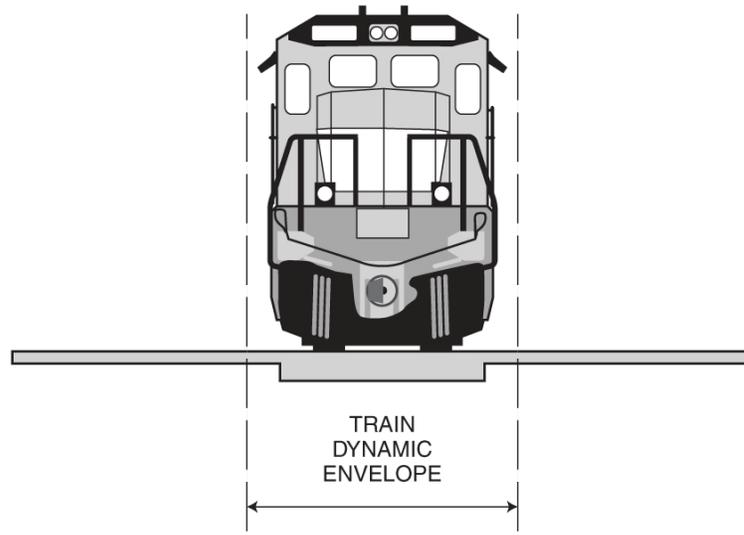
In Part 8, the combination of devices selected or installed at a specific highway-rail grade crossing is referred to as a “traffic control system.”

#### **Standard:**

**The traffic control devices, systems, and practices described herein shall be used at all highway-rail grade crossings open to public travel, consistent with Federal, State, and local laws and regulations.**

**To promote an understanding of common terminology between highway and railroad signaling issues, the following definitions shall be used:**

1. **Advance Preemption**—the notification of an approaching train that is forwarded to the highway traffic signal controller unit or assembly by the railroad equipment in advance of the activation of the railroad warning devices.
2. **Advance Preemption Time**—the period of time that is the difference between the required maximum highway traffic signal preemption time and the activation of the railroad warning devices.
3. **Cantilevered Signal Structure**—a structure that is rigidly attached to a vertical pole and is used to provide overhead support of signal units.
4. **Clear Storage Distance**—the distance available for vehicle storage measured between 1.8 m (6 ft) from the rail nearest the intersection to the intersection stop line or the normal stopping point on the highway. At skewed highway-rail grade crossings and intersections, the 1.8 m (6 ft) distance shall be measured perpendicular to the nearest rail either along the centerline or edge line of the highway, as appropriate, to obtain the shorter distance. Where exit gates are used, the distance available for vehicle storage is measured from the point where the rear of the vehicle would be clear of the exit gate arm. In cases where the exit gate arm is parallel to the track(s) and is not perpendicular to the highway, the distance is measured either along the centerline or edge line of the highway, as appropriate, to obtain the shorter distance.
5. **Design Vehicle**—the longest vehicle permitted by statute of the road authority (State or other) on that roadway.
6. **Dynamic Envelope**—the clearance required for the train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure (see Figure 8A-1).
7. **Dynamic Exit Gate Operating Mode**—a mode of operation where the exit gate operation is based on the presence of vehicles within the minimum track clearance distance.
8. **Exit Gate Clearance Time**—for Four-Quadrant Gate systems, the exit gate clearance time is the amount of time provided to delay the descent of the exit gate arm(s) after entrance gate arm(s) begin to descend.
9. **Exit Gate Operating Mode**—for Four-Quadrant Gate systems, the mode of control used to govern the operation of the exit gate arms.
10. **Flashing-Light Signals**—a warning device consisting of two red signal indications arranged horizontally that are activated to flash alternately when a train is approaching or present at a highway-rail grade crossing.
11. **Interconnection**—the electrical connection between the railroad active warning system and the highway traffic signal controller assembly for the purpose of preemption.
12. **Maximum Highway Traffic Signal Preemption Time**—the maximum amount of time needed following initiation of the preemption sequence for the highway traffic signals to complete the timing of the right-of-way transfer time, queue clearance time, and separation time.

**Figure 8A-1. Train Dynamic Envelope**

13. **Minimum Track Clearance Distance**—for standard two-quadrant railroad warning devices, the minimum track clearance distance is the length along a highway at one or more railroad tracks, measured either from the highway stop line, warning device, or 12 ft perpendicular to the track centerline, to 6 ft beyond the track(s) measured perpendicular to the far rail, along the centerline or edge line of the highway, as appropriate, to obtain the longer distance. For Four-Quadrant Gate systems, the minimum track clearance distance is the length along a highway at one or more railroad tracks, measured either from the highway stop line or entrance warning device, to the point where the rear of the vehicle would be clear of the exit gate arm. In cases where the exit gate arm is parallel to the track(s) and is not perpendicular to the highway, the distance is measured either along the centerline or edge of the highway, as appropriate, to obtain the longer distance.
14. **Minimum Warning Time**—Through Train Movements—the least amount of time active warning devices shall operate prior to the arrival of a train at a highway-rail grade crossing.
15. **Preemption**—the transfer of normal operation of highway traffic signals to a special control mode.
16. **Pre-signal**—supplemental highway traffic signal faces operated as part of the highway intersection traffic signals, located in a position that controls traffic approaching the highway-rail grade crossing in advance of the intersection.
17. **Queue Clearance Time**—the time required for the design vehicle of maximum length stopped just inside the minimum track clearance distance to start up and move through and clear the entire minimum track clearance distance. If presignals are present, this time shall be long enough to allow the vehicle to move through the intersection, or to clear the tracks if there is sufficient clear storage distance. If a Four-Quadrant Gate system is present, this time shall be long enough to permit the exit gate arm to lower after the design vehicle is clear of the minimum track clearance distance.
18. **Right-of-Way Transfer Time**—the maximum amount of time needed for the worst case condition, prior to display of the track clearance green interval. This includes any railroad or highway traffic signal control equipment time to react to a preemption call, and any traffic control signal green, pedestrian walk and clearance, yellow change, and red clearance intervals for conflicting traffic.
19. **Separation Time**—the component of maximum highway traffic signal preemption time during which the minimum track clearance distance is clear of vehicular traffic prior to the arrival of the train.
20. **Simultaneous Preemption**—notification of an approaching train is forwarded to the highway traffic signal controller unit or assembly and railroad active warning devices at the same time.
21. **Timed Exit Gate Operating Mode**—a mode of operation where the exit gate descent is based on a predetermined time interval.
22. **Vehicle Intrusion Detection Devices**—a detector or detectors used as a part of a system incorporating processing logic to detect the presence of vehicles within the minimum track clearance distance and to control the operation of the exit gates.
23. **Wayside Equipment**—the signals, switches, and/or control devices for railroad operations housed within one or more enclosures located along the railroad right-of-way and/or on railroad property.

**Section 8A.02 Use of Standard Devices, Systems, and Practices****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 Highway-Rail Intersection components is available from USDOT's Federal Railroad Administration, 1120 Vermont Ave., NW, Washington, DC 20590, or [www.fra.dot.gov](http://www.fra.dot.gov).

**Standard:**

**Traffic control devices, systems, and practices shall be consistent with the design and application of the Standards contained herein.**

**Before any 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 vehicle operators and pedestrians, these devices, systems, and practices should use the five basic considerations employed generally for traffic control devices and described fully in Section 1A.02: 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.

**Section 8A.03 Uniform Provisions****Standard:**

**All signs used in highway-rail grade crossing traffic control systems shall be retroreflectorized or illuminated as described in Section 2A.08 to show the same shape and similar color to an approaching road user during both day and night.**

**No sign or signal shall be located in the center of an undivided highway, except in a raised island.**

**The installation and maintenance of signs, signals, and other traffic control devices installed within the Railroad Right-of-Way shall be the responsibility of the Railroad owner.**

**Guidance:**

Such signs or signals should be installed with a clearance of at least 2 ft from the outer edge of the raised island to the nearest edge of the sign or signal, except as allowed in Section 2A.19.

Where the distance between tracks, measured along the highway between the inside rail, exceeds 100 ft, additional signs or other appropriate traffic control devices should be used.

**Section 8A.04 Highway-Rail Grade Crossing Elimination****Guidance:**

Because highway-rail grade crossings are a potential source of crashes and congestion, agencies should conduct engineering studies to determine the cost and benefits of eliminating these crossings.

**Standard:**

**When a highway-rail grade crossing is eliminated, the traffic control devices for the crossing shall be removed.**

**If the existing traffic control devices at a multiple-track highway-rail grade crossing become improperly placed or inaccurate because of the removal of some of the tracks, the existing devices shall be relocated and/or modified.**

**Guidance:**

Any highway-rail grade crossing that cannot be justified should be eliminated.

Where a roadway is removed from a highway-rail grade crossing, the roadway approaches in the railroad right-of-way should also be removed and appropriate signs should be placed at the roadway end in accordance with Section 3C.04.

Where a railroad is eliminated at a highway-rail grade crossing, the tracks should be removed or paved over.

**Option:**

Based on engineering judgment, the TRACKS OUT OF SERVICE (R8-9) sign (see Figure 8B-3) may be temporarily installed until the tracks are removed or paved over. The length of time before the tracks will be removed or paved over may be considered in making the decision as to whether to install the sign.

**Section 8A.05 Temporary Traffic Control Zones****Support:**

Temporary traffic control planning provides for continuity of operations (such as movement of traffic, pedestrians and bicycles, transit operations, and access to property/utilities) when the normal function of a roadway at a highway-rail grade crossing is suspended because of temporary traffic control operations.

**Standard:**

**Traffic controls for temporary traffic control zones that include highway-rail grade crossings shall be as outlined in Part 6.**

**When a highway-rail grade crossing exists either within or in the vicinity of a temporary traffic control zone, lane restrictions, flagging, or other operations shall not be performed in a manner that would cause vehicles to stop on the railroad tracks, unless a law enforcement officer or flagger is provided at the highway-rail grade crossing to minimize the possibility of vehicles stopping on the tracks, even if automatic warning devices are in place.**

**Guidance:**

Public and private agencies, including emergency services, businesses, and railroad companies, should meet to plan appropriate traffic detours and the necessary signing, marking, and flagging requirements for operations during temporary traffic control zone activities. Consideration should be given to the length of time that the highway-rail grade crossing is to be closed, the type of rail and highway traffic affected, the time of day, and the materials and techniques of repair.

Temporary traffic control operations should minimize the inconvenience, delay, and crash potential to affected traffic. Prior notice should be given to affected public or private agencies, emergency services, businesses, railroad companies, and road users before the free movement of vehicles or trains is infringed upon or blocked.

Temporary traffic control zone activities should not be permitted to extensively prolong the closing of the highway-rail grade crossing.

The width, grade, alignment, and riding quality of the highway surface at a highway-rail grade crossing should, at a minimum, be restored to correspond with the quality of the approaches to the highway-rail grade crossing.

## CHAPTER 8B. SIGNS AND MARKINGS

### Section 8B.01 Purpose

Support:

Passive traffic control systems, consisting of signs and pavement markings, identify and direct attention to the location of a highway-rail grade crossing and advise motorists, bicyclists, and pedestrians to take appropriate action.

### Section 8B.02 Sizes of Grade Crossing Signs

Standard:

The sizes of grade crossing signs shall be as shown in Table 8B-1.

Option:

Signs larger than those shown in Table 8B-1 may be used (see Section 2A.12).

### Section 8B.03 Highway-Rail Grade Crossing (Crossbuck) Sign (R15-1) and Number of Tracks Sign (R15-2)

Standard:

The Highway-Rail Grade Crossing (R15-1) sign, commonly identified as the Crossbuck sign, shall be retroreflectorized white with the words RAILROAD CROSSING in black lettering, mounted as shown in Figure 8B-1.

As a minimum, one Crossbuck sign shall be used on each highway approach to every highway-rail grade crossing, alone or in combination with other traffic control devices.

If automatic gates are not present and if there are two or more tracks at the highway-rail grade crossing, the number of tracks shall be indicated on a supplemental Number of Tracks (R15-2) sign of inverted T shape mounted below the Crossbuck sign in the manner and at the height indicated in Figure 8B-1.

Option:

The supplemental Number of Tracks sign may also be used at highway-rail grade crossings with automatic gates.

Standard:

The Crossbuck sign shall be installed on the right side of the highway on each approach to the highway-rail grade crossing. Where restricted sight distance or unfavorable highway geometry exists on an approach to a highway-rail grade crossing, an additional Crossbuck sign shall be installed on the left side of the highway, possibly placed back-to-back with the Crossbuck sign for the opposite approach, or otherwise located so that two Crossbuck signs are displayed for that approach.

A strip of retroreflective white material not less than 2 inches in width shall be used on the back of each blade of each Crossbuck sign for the length of each blade, at all highway-rail grade crossings, except those where Crossbuck signs have been installed back-to-back.

A strip of retroreflective white material, not less than 2 inches in width, shall be used on each support at passive highway-rail grade crossings for the full length of the front and back of the support from the Crossbuck sign or Number of Tracks sign to within 2 ft above the edge of the roadway, except on the side of those supports where a STOP (R1-1) or YIELD(R1-2) sign or flashing lights have been installed or on the back side of supports for Crossbuck signs installed on one-way streets.

Guidance:

Crossbuck signs should be located with respect to the highway pavement or shoulder in accordance with the criteria in Chapter 2A and Figures 2A-1 and 2A-2, and should be located with respect to the nearest track in accordance with Figure 8D-2.

The minimum lateral clearance for the nearest edge of the Crossbuck sign should be 6 ft from the edge of the shoulder or 12 ft from the edge of the traveled way in rural areas (whichever is greater), and 2 ft from the face of the curb in urban areas.

Where unusual conditions make variations in location and lateral clearance appropriate, engineering judgment should be used to provide the best practical combination of view and safety clearances.

**Table 8B-1. Sign Sizes for Grade Crossing Signs (Sheet 1 of 2)**

Sign	DelDOT MUTCD Code	Section	Conventional Road	Expressway	Minimum	Oversized
No Right Turn Across Tracks	R3-1a	8B.06, 10C.09	600 x 750 (24 x 30)	---	---	---
No Left Turn Across Tracks	R3-2a	8B.06, 10C.09	600 x 750 (24 x 30)	---	---	---
Do Not Stop on Tracks	R8-8	8B.07, 10C.05	600 x 750 (24 x 30)	---	---	---
Tracks Out of Service	R8-9	8B.09, 10C.06	600 x 600 (24 x 24)	---	---	---
Stop Here When Flashing	R8-10	8B.10, 10C.08	600 x 900 (24 x 36)	---	---	---
Stop Here on Red	R10-6	8B.11, 10C.07	600 x 900 (24 x 36)	---	---	---
No Turn on Red (Ball)	R10-11a	8D.07, 10C.09	600 x 750 (24 x 30)	---	---	---
No Turn on Red (Arrow)	R10-11-DE	8D.07, 10C.09	600 x 750 (24 x 30)	---	---	---
Highway-Rail Grade Crossing (Crossbuck)	R15-1	8B.03, 10C.02	1200 x 225 (48 x 9)	---	---	---
Number of Tracks	R15-2	8B.03, 10C.02	675 x 450 (27 x 18)	---	---	---
Exempt	R15-3	8B.05, 10C.10	600 x 300 (24 x 12)	---	---	---
Light Rail Only Right Lane	R15-4a	10C.13	600 x 750 (24 x 30)	---	---	---
Light Rail Only Left Lane	R15-4b	10C.13	600 x 750 (24 x 30)	---	---	---
Light Rail Only Center Lane	R15-4c	10C.13	600 x 750 (24 x 30)	---	---	---
Light Rail Do Not Pass	R15-5	10C.14	600 x 750 (24 x 30)	---	---	---
Do Not Pass Stopped Trains	R15-5a	10C.14	600 x 750 (24 x 30)	---	---	---
Do Not Drive on Tracks Light Rail Symbol	R15-6	10C.12	600 x 600 (24 x 24)	---	---	---
Do Not Drive on Tracks	R15-6a	10C.12	600 x 750 (24 x 30)	---	---	---
Light Rail Divided Highway Symbol	R15-7	10C.11	600 x 600 (24 x 24)	---	---	---
Light Rail Divided Highway Symbol (T-Intersection)	R15-7a	10C.11	600 x 600 (24 x 24)	---	---	---
Look	R15-8	8B.16, 10C.03	900 x 450 (36 x 18)	---	---	---
Highway-Rail Grade Crossing Advance Warning	W10-1	8B.04, 10C.15	900 Dia. (36 Dia.)	---	---	---
Exempt	W10-1a	8B.05, 10C.10	600 x 300 (24 x 12)	---	---	---
Highway-Rail Grade Crossing Advance Warning	W10-2, 3, 4	8B.04, 10C.15	900 x 900 (36 x 36)	---	---	---
Low Ground Clearance Highway-Rail Grade Crossing	W10-5	8B.17, 10C.16	900 x 900 (36 x 36)	---	---	---
Light Rail Advanced Blank- Out Symbol	W10-7	10C.17	600 x 600 (24 x 24)	---	---	---
Trains May Exceed 80 MPH	W10-8	8B.13	900 x 900 (36 x 36)	---	---	---
No Train Horn	W10-9	8B.14	600 x 450 (24 x 18)	---	---	---
No Signal	W10-10	8B.15	600 x 450 (24 x 18)	---	---	---
Storage Space Symbol	W10-11	8B.18, 10C.18	900 x 900 (36 x 36)	---	---	---

**Table 8B-1. Sign Sizes for Grade Crossing Signs (Sheet 2 of 2)**

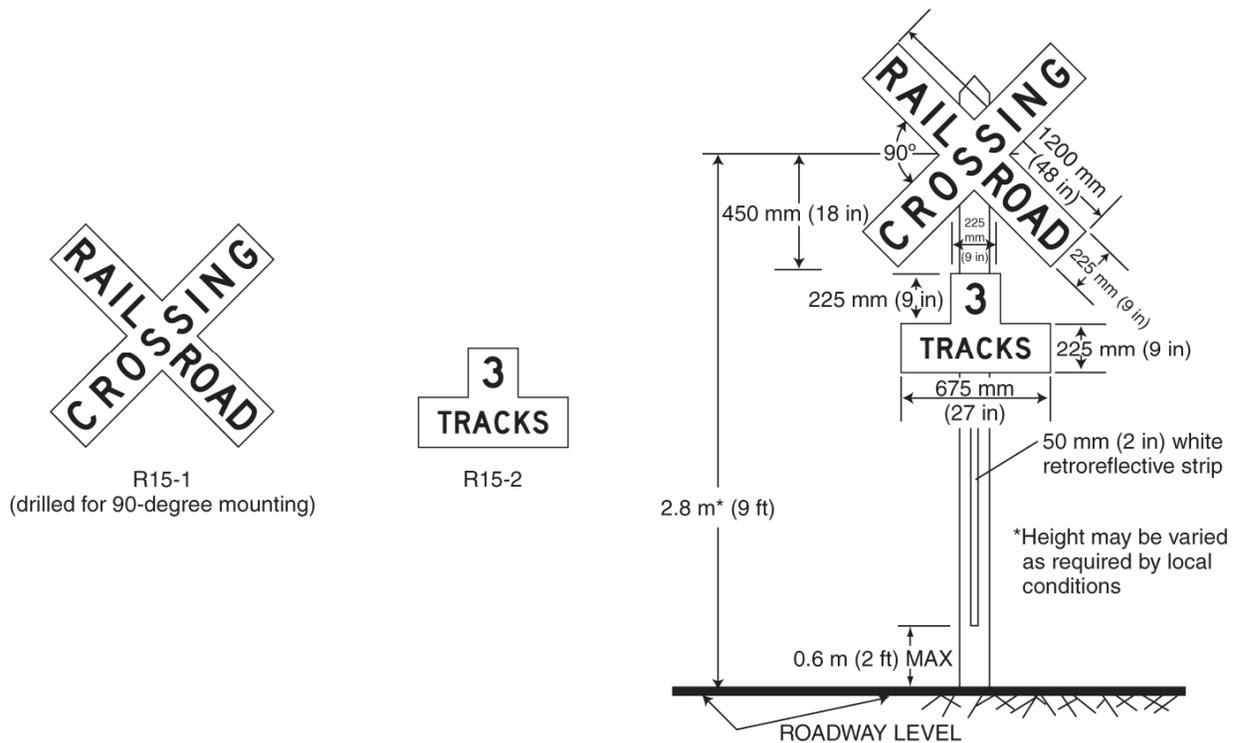
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Sign	DeIDOT MUTCD Code	Section	Conventional Road	Expressway	Minimum	Oversized
Storage Space XX Feet Between Tracks & Highway	W10-11a	8B.18, 10C.18	750 x 900 (30 x 36)	---	---	---
Storage Space XX Feet Between Highway & Tracks Behind You	W10-11b	8B.18, 10C.18	750 x 900 (30 x 36)	---	---	---
Skewed Crossing	W10-12	8B.19, 10C.19	900 x 900 (36 x 36)	---	---	---
Cycles Use Caution	W10-12p-DE	8B.19	600 x 450 (24 x 18)	---	---	---
No Gates or Lights	W10-13	8B.15	600 x 450 (24 x 18)	---	---	---
Next Crossing	W10-14	8B.17	600 x 450 (24 x 18)	---	---	---
Use Next Crossing	W10-14a	8B.17	600 x 18 (24 x 18)	---	---	---
Rough Crossing	W10-15	8B.17	600 x 450 (24 x 18)	---	---	---
Light Rail Station Symbol	I-12	10C.20	600 x 600 (24 x 24)	---	---	---
Emergency Notification	I-13	8B.12, 10C.21	750 x 750 (30 x 30)	---	---	---
Emergency Notification	I-13a	8B.12, 10C.21	750 x 450 (30 x 18)	---	---	---

**Notes:**

1. Larger signs may be used when appropriate.
2. Dimensions are shown in millimeters follows by inches in parenthesis and are shown as width x height.

**Figure 8B-1. Highway-Rail Grade Crossing (Crossbuck) Regulatory Signs**



#### Section 8B.04 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)

##### Standard:

A Highway-Rail Grade Crossing Advance Warning (W10-1) sign (see Figure 8B-2) shall be used on each highway in advance of every highway-rail grade crossing except in the following circumstances:

- A. On an approach to a highway-rail grade crossing from a T-intersection with a parallel highway, if the distance from the edge of the track to the edge of the parallel roadway is less than 100 ft, and W10-3 signs are used on both approaches of the parallel highway; or
- B. On low-volume, low-speed highways crossing minor spurs or other tracks that are infrequently used and are flagged by train crews; or
- C. In business districts where active highway-rail grade crossing traffic control devices are in use; or
- D. Where physical conditions do not permit even a partially effective display of the sign.

Placement of the Highway-Rail Grade Crossing Advance Warning sign shall be in accordance with Chapter 2A and Table 2C-4.

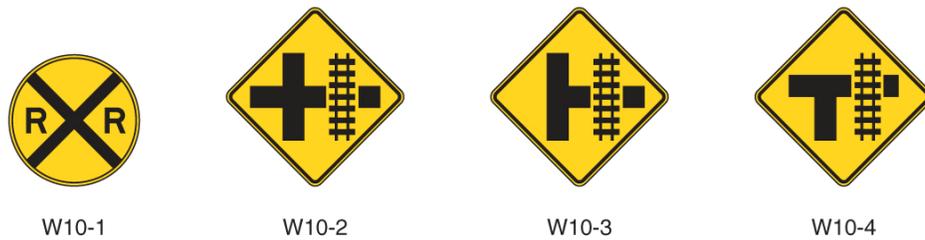
##### Option:

On divided highways and one-way streets, an additional W10-1 sign may be installed on the left side of the roadway.

##### Standard:

If the distance between the railroad tracks and a parallel highway, from the edge of the tracks to the edge of the parallel roadway, is less than 100 ft, W10-2, W10-3, or W10-4 signs (see Figure 8B-2) shall be installed on each approach of the parallel highway to warn road users making a turn that they will encounter a highway-rail grade crossing soon after making a turn, and a W10-1 sign for the approach to the tracks shall not be required to be between the tracks and the parallel highway.

If the W10-2, W10-3, or W10-4 signs are used, sign placement in accordance with the guidelines for Intersection Warning signs in Table 2C-4 using the speed of through traffic shall be measured from the highway intersection.

**Figure 8B-2. Advance Warning Signs****Guidance:**

If the distance between the railroad tracks and the parallel highway, from the edge of the tracks to the edge of the parallel roadway, is 100 ft or more, a W10-1 sign should be installed in advance of the highway-rail grade crossing, and the W10-2, W10-3, or W10-4 signs should not be used on the parallel highway.

**Section 8B.05 EXEMPT Highway-Rail Grade Crossing Signs (R15-3, W10-1a)****Option:**

When authorized by law or regulation, a supplemental EXEMPT (R15-3) sign (see Figure 8B-3) with a white background bearing the word EXEMPT may be used below the Crossbuck sign or Number of Tracks sign, if present, at the highway-rail grade crossing, and a supplemental EXEMPT (W10-1a) sign (see Figure 8B-5) with a yellow background bearing the word EXEMPT may be used below the Highway-Rail Advance Warning (W10-1) sign.

**Support:**

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

**Section 8B.06 Turn Restrictions During Preemption****Guidance:**

At a signalized intersection that is located within 200 ft 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 shown in Figure 8B-3 may be used for this purpose.

**Standard:**

**Turn prohibition signs that are associated with preemption shall be visible only when the highway-rail grade crossing restriction is in effect.**

**Section 8B.07 DO NOT STOP ON TRACKS Sign (R8-8)****Guidance:**

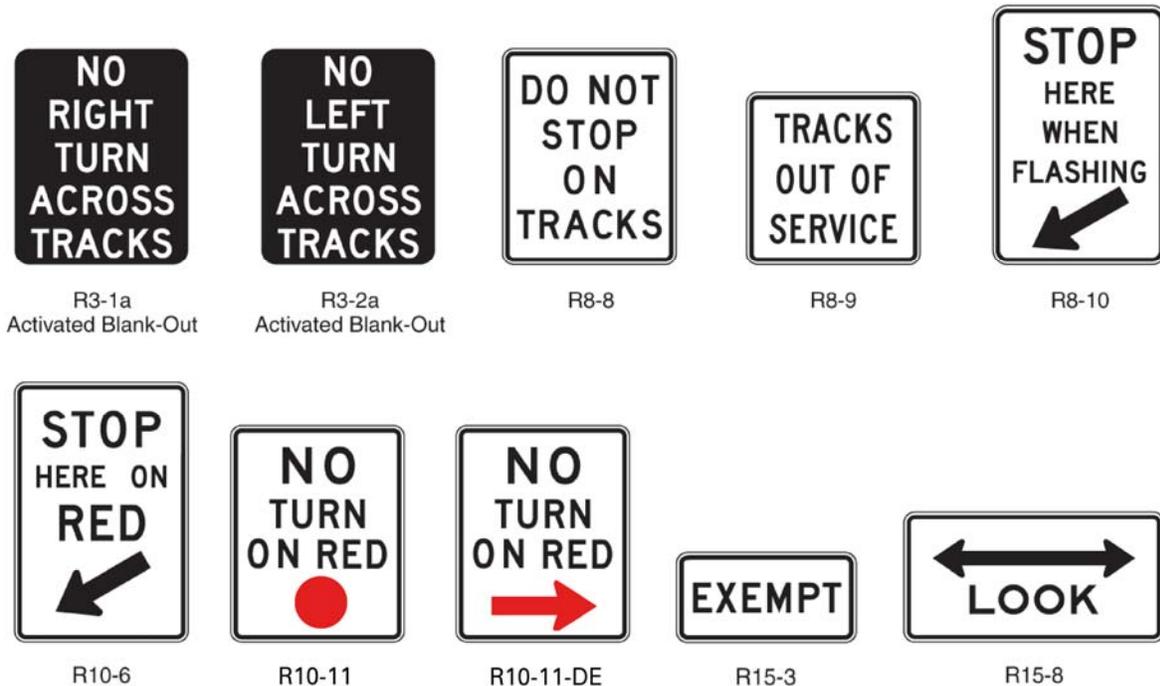
Whenever engineering judgment determines that the potential for vehicles stopping on the tracks is high, a DO NOT STOP ON TRACKS (R8-8) sign (see Figure 8B-3) should be used.

The sign, if used, should be located on the right side of the highway on either the near or far side of the highway-rail grade crossing, depending upon which side provides better visibility to approaching drivers.

**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 side of the highway-rail grade crossing to further improve visibility of the sign.

**Figure 8B-3. Regulatory Signs****Section 8B.08 STOP (R1-1) or YIELD (R1-2) Signs at Highway-Rail Grade Crossings****Option:**

At the discretion of the responsible State or local highway agency, STOP (R1-1) or YIELD (R1-2) signs (see Figure 2B-1) may be used at highway-rail grade crossings that have two or more trains per day and are without automatic traffic control devices.

**Support:**

Two or more trains per day means an average of two or more trains per day operating over the highway-rail grade crossing for a 12-month period prior to the installation of the STOP or YIELD control sign.

**Option:**

For other highway-rail grade crossings with passive warning devices, STOP or YIELD signs may be used based on an engineering study.

**Guidance:**

The engineering study should take into consideration such factors as highway and train traffic characteristics (including volume and speed), collision history, the need for active control devices, and sight distance to the approaching train.

**Option:**

If a STOP or YIELD sign is installed at a highway-rail grade crossing, it may be installed on the Crossbuck post or on a separate post at a point where the vehicle is to stop, or as near to that point as practical.

**Standard:**

For all highway-rail grade crossings where STOP or YIELD signs are installed, the placement shall conform to the requirements of Sections 2B.06 and 2B.10. Stop Ahead (W3-1) or Yield Ahead (W3-2) Advance Warning signs (see Figure 2C-4) shall also be installed if the criteria for their installation given in Section 2C.29 is met.

**Section 8B.09 TRACKS OUT OF SERVICE Sign (R8-9)**

Option:

The TRACKS OUT OF SERVICE (R8-9) sign (see Figure 8B-3) may be used at a highway-rail grade crossing instead of a Crossbuck (R15-1) sign and a Number of Tracks (R15-2) sign (see Figure 8B-1) when railroad tracks have been temporarily or permanently abandoned, but only until such time that the tracks are removed or paved over.

**Standard:**

**When tracks are out of service, traffic control devices and gate arms shall be removed and the signal heads shall be removed or hooded or turned from view to clearly indicate that they are not in operation.**

**The R8-9 sign shall be removed when the tracks have been removed or covered or when the highway-rail grade crossing is returned to service.**

**Section 8B.10 STOP HERE WHEN FLASHING Sign (R8-10)**

Option:

The STOP HERE WHEN FLASHING (R8-10) sign (see Figure 8B-3) may be used at a highway-rail grade crossing to inform drivers of the location of the stop line or the point at which to stop when the flashing-light signals (see Section 8D.02) are activated.

**Section 8B.11 STOP HERE ON RED Sign (R10-6)**

Support:

The STOP HERE ON RED (R10-6) sign (see Figure 8B-3) defines and facilitates observance of stop lines at traffic control signals.

Option:

A STOP HERE ON RED sign may be used at locations where vehicles frequently violate the stop line or where it is not obvious to road users where to stop.

Guidance:

If possible, stop lines should be placed at a point where the vehicle driver has adequate sight distance along the track.

**Section 8B.12 Emergency Notification Sign (I-13 or I-13a)**

Guidance:

An Emergency Notification (I-13 or I-13a) sign (see Figure 8B-4) should be installed at all highway-rail grade crossings to provide for emergency notification. The sign should have a white message on blue background.

Location and placement should be decided cooperatively by the railroad company and the public or private highway agencies based on specific site conditions. However, these signs are typically located on the railroad right-of-way.

This sign, which is for emergency notification, should convey a clear and simple message that is visible to anyone stalled or disabled on the railroad tracks, and to anyone with other emergencies.

Support:

Examples of sign messages are shown in Figure 8B-4.

**Section 8B.13 TRAINS MAY EXCEED 80 MPH Sign (W10-8)**

Guidance:

Where trains are permitted to travel at speeds exceeding 80 mph, a TRAINS MAY EXCEED 80 MPH (W10-8) sign (see Figure 8B-5) should be installed facing road users approaching the highway-rail grade crossing.

If used, the TRAINS MAY EXCEED 80 MPH signs should be installed between the Highway-Rail Grade Crossing Advance Warning (W10-1) sign (see Figure 8B-2) and the highway-rail grade crossing on all approaches to the highway-rail grade crossing. The locations should be determined based on specific site conditions.

**Figure 8B-4. Emergency Notification Signs****Section 8B.14 NO TRAIN HORN Sign (W10-9)****Standard:**

A NO TRAIN HORN (W10-9) sign (see Figure 8B-5) shall be installed at each highway-rail grade crossing where there is a Federal Railroad Administration authorization for trains to not sound a horn. The sign shall be mounted as a supplemental plaque below the Highway-Rail Grade Crossing Advance Warning (W10-1) sign (see Figure 8B-2).

**Section 8B.15 NO SIGNAL Sign (W10-10) or NO GATES OR LIGHTS Sign (W10-13)****Option:**

A NO SIGNAL (W10-10) sign or a NO GATES OR LIGHTS (W10-13) sign (see Figure 8B-5) may be installed at highway-rail grade crossings that are not equipped with automated signals.

The NO SIGNAL (W10-10) sign or the NO GATES OR LIGHTS (W10-13) sign may be mounted as a supplemental plaque below the Advance Warning (W10-1) sign.

**Section 8B.16 LOOK Sign (R15-8)****Option:**

At highway-rail grade crossings, the LOOK (R15-8) sign (see Figure 8B-3) may be mounted as a supplemental plaque on the Crossbuck (R15-1) sign post, or as a separate sign in the immediate vicinity of the highway-rail grade crossing on the railroad right-of-way.

**Section 8B.17 Low Ground Clearance Highway-Rail Grade Crossing Sign (W10-5)****Guidance:**

If the highway profile conditions are sufficiently abrupt to create a hang-up situation for long wheelbase vehicles or for trailers with low ground clearance, the Low Ground Clearance Highway-Rail Grade Crossing (W10-5) sign (see Figure 8B-5) should be installed in advance of the highway-rail grade crossing.

**Standard:**

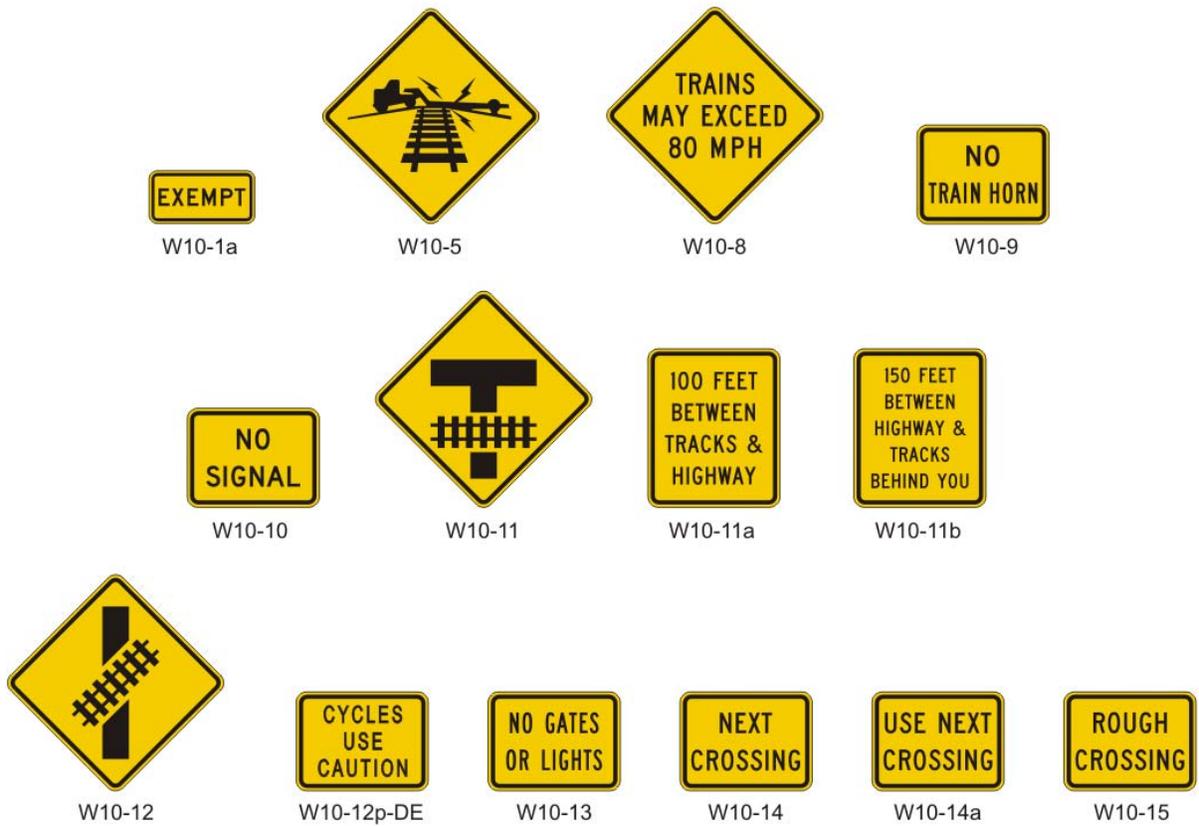
Because this symbol might not be readily recognizable by the public, the Low Ground Clearance Highway-Rail Grade Crossing (W10-5) warning sign shall be accompanied by an educational plaque, **LOW GROUND CLEARANCE**. The **LOW GROUND CLEARANCE** educational plaque shall remain in place for at least 3 years after the initial installation of the W10-5 sign (see Section 2A.13).

**Guidance:**

Auxiliary plaques such as AHEAD, NEXT CROSSING, or USE NEXT CROSSING (with appropriate arrows), or a supplemental distance plaque should be placed below the W10-5 sign at the nearest intersecting highway where a vehicle can detour or at a point on the highway wide enough to permit a U-turn.

If engineering judgment of roadway geometric and operating conditions confirms that vehicle speeds across the railroad tracks should be below the posted speed limit, a W13-1 advisory speed plaque should be posted.

**Figure 8B-5. Warning Signs**



Note: The W10-11 sign is a W10-3 sign modified for geometrics. Other signs can be oriented or revised as needed to satisfy the geometrics of the roadway and the railroad tracks

**Option:**

If the highway-rail grade crossing is rough, word message signs such as BUMP, DIP, or ROUGH CROSSING may be installed. A W13-1 advisory speed plaque may be installed below the word message sign in advance of rough crossings.

**Support:**

Information on railroad ground clearance requirements is also available in the “American Railway Engineering and Maintenance-of-Way Association’s Engineering Manual,” or the American Association of State Highway and Transportation Officials’ “Policy on Geometric Design of Highways and Streets” (see Section 1A.11).

**Section 8B.18 Storage Space Signs (W10-11, W10-11a, W10-11b)**

**Guidance:**

A Storage Space (W10-11) sign supplemented by a word message storage distance (W10-11a) sign (see Figure 8B-5) should be used where there is a highway intersection in close proximity to the highway-rail grade crossing and an engineering study determines that adequate space is not available to store a design vehicle(s) between the highway intersection and the train dynamic envelope.

The Storage Space (W10-11 and W10-11a) signs should be mounted in advance of the highway-rail grade crossing at an appropriate location to advise drivers of the space available for vehicle storage between the highway intersection and the highway-rail grade crossing.

Option:

A Storage Space (W10-11b) sign (see Figure 8B-5) may be mounted beyond the highway-rail grade crossing at the highway intersection under the STOP or YIELD sign or just prior to the signalized intersection to remind drivers of the storage space between the tracks and the highway intersection.

### **Section 8B.19 Skewed Crossing Sign (W10-12)**

Option:

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The Skewed Crossing (W10-12) sign (see Figure 8B-5) may be used at a skewed highway-rail grade crossing to warn drivers that the railroad tracks are not perpendicular to the highway.

The CYCLES USE CAUTION (W10-12p-DE) plaque may be used to supplement the W10-12 sign.

Guidance:

If the Skewed Crossing sign is used, the symbol should show the direction of the crossing (near left to far right as shown in Figure 8B-5, or the mirror image if the track goes from far left to near right). If the Skewed Crossing sign is used where the angle of the crossing is significantly different than 45 degrees, the symbol should show the approximate angle of the crossing.

**Standard:**

**The Skewed Crossing sign shall not be used as a replacement for the required Advance Warning (W10-1) sign. If used, the Skewed Crossing sign shall supplement the W10-1 sign and shall be mounted on a separate post.**

### **Section 8B.20 Pavement Markings**

**Standard:**

**All highway-rail grade crossing pavement markings shall be retroreflectorized white. All other markings shall be in accordance with Part 3.**

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**Pavement markings in advance of a highway-rail grade crossing shall consist of an X, the letters RR, a no-passing marking for both directions of travel (two-lane highways where centerline markings are used), and certain transverse lines as shown in Figures 8B-6 and 8B-7.**

**Identical markings shall be placed in each approach lane on all paved approaches to highway-rail grade crossings where signals or automatic gates are located, and at all other highway-rail grade crossings where the posted or statutory highway speed is 40 mph or greater.**

**Pavement markings shall not be required at highway-rail grade crossings where the posted or statutory highway speed is less than 40 mph, or in urban areas, if an engineering study indicates that other installed devices provide suitable warning and control.**

Guidance:

When pavement markings are used, a portion of the X symbol should be directly opposite the Advance Warning sign. The X symbol and letters should be elongated to allow for the low angle at which they will be viewed.

Option:

When justified by engineering judgment, supplemental pavement marking symbol(s) may be placed between the Advance Warning sign and the highway-rail grade crossing.

### **Section 8B.21 Stop Lines**

Guidance:

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The stop line should be a transverse line at a right angle to the traveled way at a point where a vehicle is to stop or as near to that point as possible. The stop line should be placed approximately 8 ft from the gate or active warning device (if present), but no closer than 15 ft from the nearest rail. Site specific conditions, such as sight distance constraints, may justify the installation of the stop line less than 8 feet from an active warning device, but the stop line should still be placed no closer than 15 ft from the nearest rail

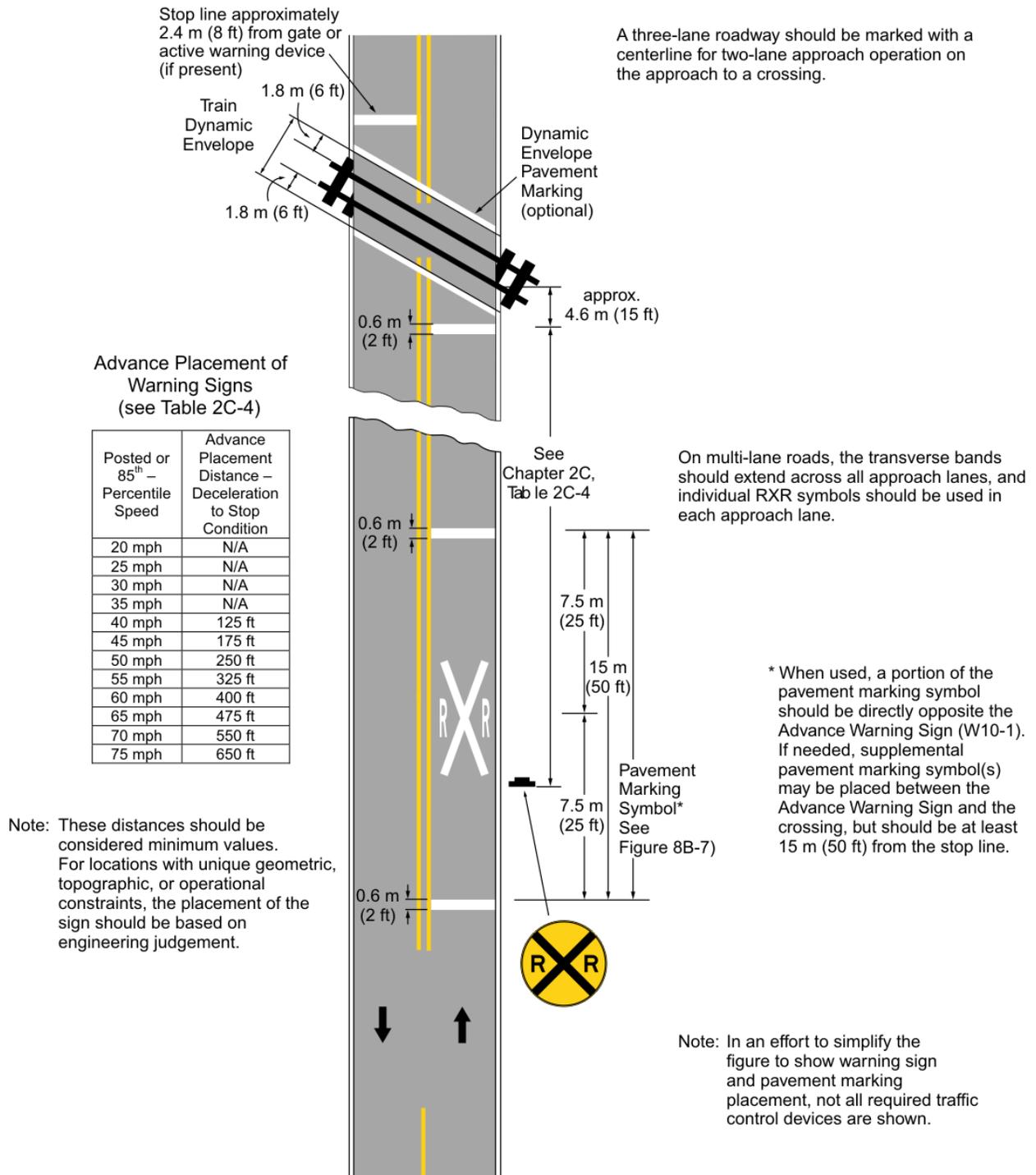
### **Section 8B.22 Dynamic Envelope Markings**

Option:

Dynamic envelope markings may be used to mark the edges of the dynamic envelope where there is a highway intersection in close proximity to the highway-rail grade crossing and an engineering study determines that vehicles might stop within the dynamic envelope area.

Dynamic envelope markings may be installed at all highway-rail grade crossings, unless a Four-Quadrant Gate system (see Section 8D.05) is used.

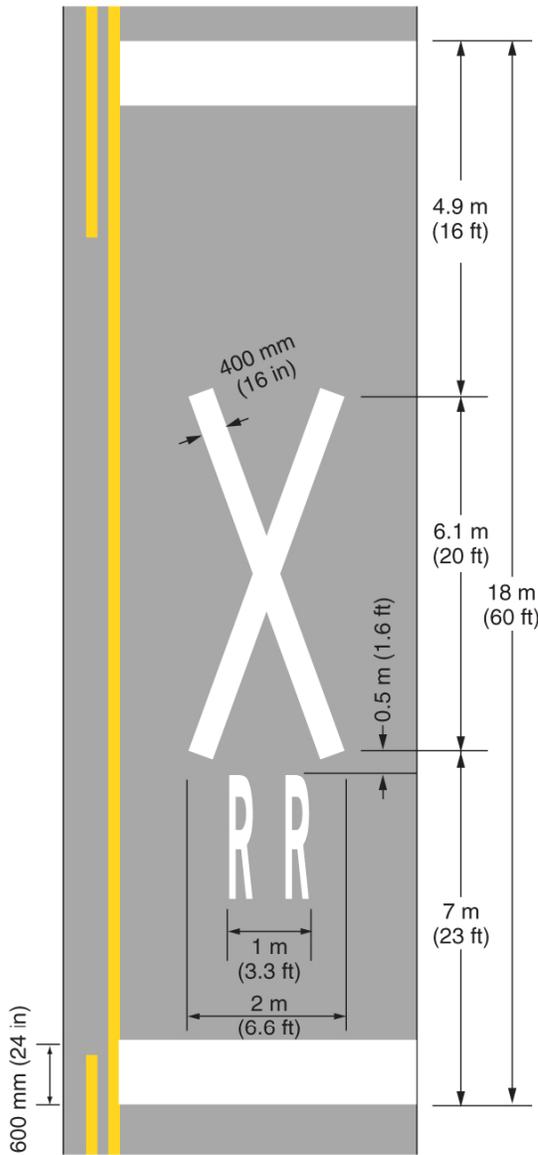
**Figure 8B-6. Example of Placement of Warning Signs and Pavement Markings at Highway-Rail Grade Crossings**



Legend

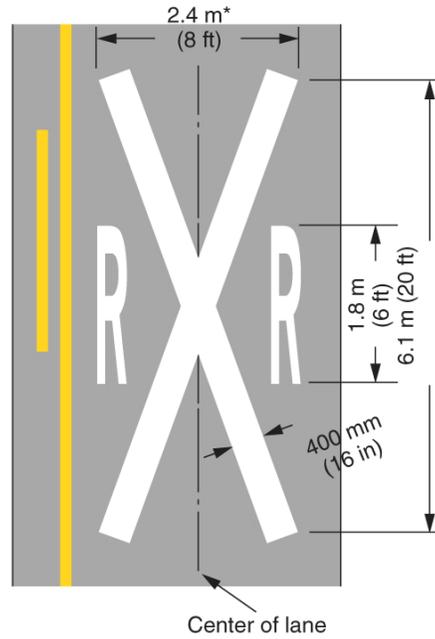
➔ Direction of travel

**Figure 8B-7. Examples of Highway-Rail Grade Crossing Pavement Markings**



**Highway-rail grade crossing alternative (narrow) pavement markings**

Note: Refer to Figure 8B-6 for placement



**Highway-rail grade crossing pavement markings**

\*Width may vary according to lane width

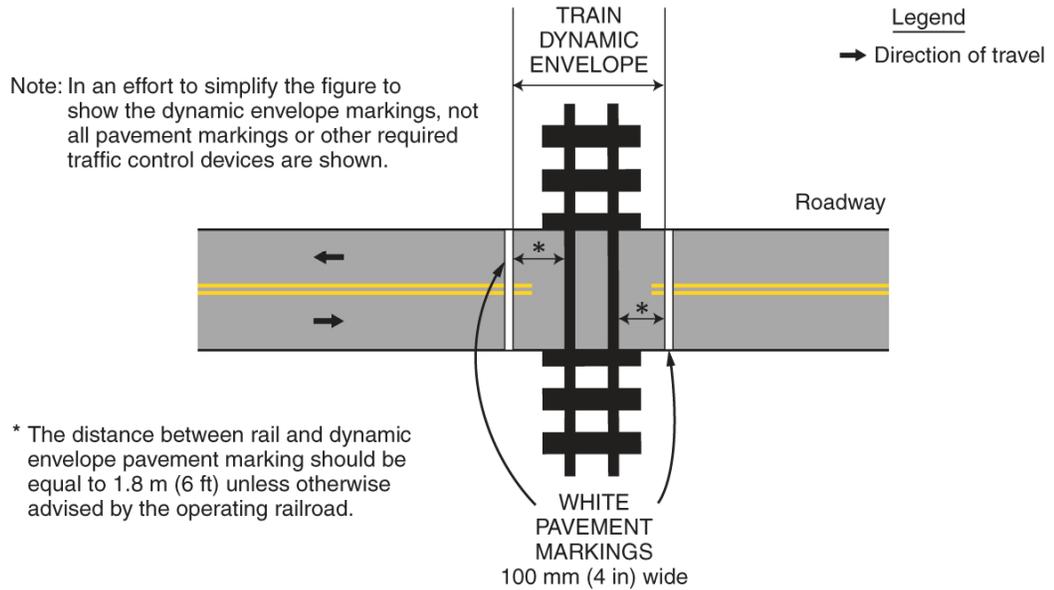
**Standard:**

**If used, pavement markings for indicating the dynamic envelope shall conform to Part 3 and shall be a 4 inch normal solid white line or contrasting pavement color and/or contrasting pavement texture.**

**Guidance:**

If used, dynamic envelope pavement markings should be placed on the highway 6 ft from the nearest rail, installed parallel to the tracks, unless the operating railroad company advises otherwise. The pavement markings should extend across the roadway as shown in Figure 8B-8.

**Figure 8B-8. Typical Train Dynamic Envelope Pavement Markings**



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## CHAPTER 8C. ILLUMINATION

### **Section 8C.01 Illumination at Highway-Rail Grade Crossings**

**Option:**

Illumination may be installed at or adjacent to a highway-rail grade crossing.

**Guidance:**

If an engineering study is conducted and if the engineering study determines that better nighttime visibility of the train and the highway-rail grade crossing is needed (for example, where a substantial amount of railroad operation is conducted at night, where train speeds are low and highway-rail grade crossings are blocked for long periods, or crash history indicates that drivers experience difficulty in seeing trains or traffic control devices during hours of darkness), then illumination should be installed at and adjacent to the highway-rail grade crossing.

**Support:**

Types and location of luminaires for highway-rail grade crossing illumination are contained in the American National Standards Institute's (ANSI) "Practice for Roadway Lighting RP-8" available from the Illuminating Engineering Society (see Section 1A.11).

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## CHAPTER 8D. FLASHING-LIGHT SIGNALS, GATES, AND TRAFFIC CONTROL SIGNALS

### Section 8D.01 Introduction

#### Support:

Active traffic control systems inform motorists, bicyclists, and pedestrians of the approach or presence of trains, locomotives, or other railroad equipment at highway-rail grade crossings.

A composite drawing (see Figure 8D-1) shows a post-mounted flashing-light signal (two light units mounted in a horizontal line), a flashing-light signal mounted on an overhead structure, and an automatic gate assembly.

#### Option:

Post-mounted and overhead-mounted flashing-light signals may be used separately or in combination with each other as determined by an engineering study. Also, flashing-light signals may be used without automatic gate assemblies, as determined by an engineering study.

#### Standard:

**The meaning of flashing-light signals and gates shall be as stated in the “Uniform Vehicle Code” (see Sections 11-701 and 11-703 of the “UVC”), which is available from the National Committee on Uniform Traffic Laws and Ordinances (see Page i for the address).**

**Location and clearance dimensions for flashing-light signals and gates shall be as shown in Figure 8D-1.**

**When there is a curb, a horizontal clearance of at least 2 ft shall be provided from the face of the vertical curb to the closest part of the signal or gate arm in its upright position. When a cantilevered-arm flashing-light signal is used, the vertical clearance shall be at least 17 ft above the crown of the highway to the lowest point of the signal unit.**

**Where there is a shoulder, but no curb, a horizontal clearance of at least 2 ft from the edge of a paved or surfaced shoulder shall be provided, with a clearance of at least 6 ft from the edge of the traveled way.**

**Where there is no curb or shoulder, the minimum horizontal clearance shall be 6 ft from the edge of the traveled way.**

#### Guidance:

Equipment housings (controller cabinets) should have a lateral clearance of at least 30 ft from the edge of the highway, and where railroad property and conditions allow, at least 25 ft from the nearest rail.

If a pedestrian route is provided, sufficient clearance from supports, posts, and gate mechanisms should be maintained for pedestrian travel.

When determined by an engineering study, a lateral escape route to the right of the highway in advance of the highway-rail grade crossing traffic control devices should be kept free of guardrail or other ground obstructions. Where guardrail is not deemed necessary or appropriate, barriers should not be used for protecting signal supports.

The same lateral clearance and roadside safety features should apply to flashing-light signal and automatic gate locations on both the right and left sides of the roadway.

#### Option:

In industrial or other areas involving only low-speed highway traffic or where signals are vulnerable to damage by turning truck traffic, guardrail may be installed to provide protection for the signal assembly.

### Section 8D.02 Flashing-Light Signals, Post-Mounted

#### Standard:

**The flashing-light signal assembly (shown in Figure 8D-1) on the side of the highway shall include a standard Crossbuck (R15-1) sign, and where there is more than one track, a supplemental Number of Tracks (R15-2) sign, all of which indicate to motorists, bicyclists, and pedestrians the location of a highway-rail grade crossing.**

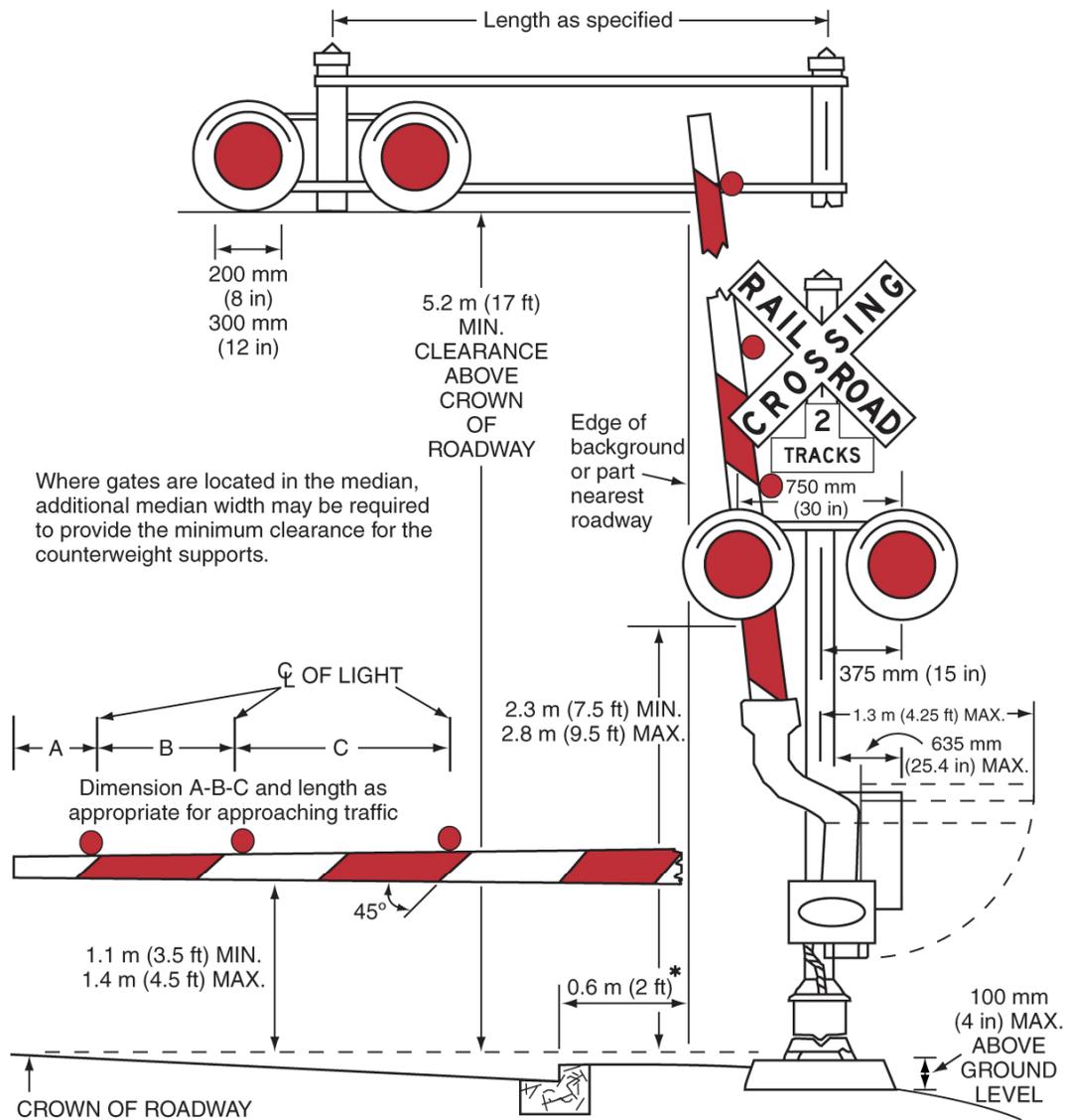
#### Option:

Bells or other audible warning devices may be included in the assembly and may be operated in conjunction with the flashing lights to provide additional warning for pedestrians and bicyclists.

#### Standard:

**When indicating the approach or presence of a train, the flashing-light signal shall display toward approaching highway traffic two red lights mounted in a horizontal line flashing alternately.**

**Figure 8D-1. Composite Drawing of Active Traffic Control Devices for Highway-Rail Grade Crossings Showing Clearances**



When used, flashing-light signals shall be placed to the right of approaching highway traffic on all highway approaches to a highway-rail grade crossing. They shall be located laterally with respect to the highway in conformance with Figure 8D-1 except where such location would adversely affect signal visibility.

At highway-rail grade crossings with highway traffic in both directions, back-to-back pairs of lights shall be placed on each side of the tracks. On multi-lane one-way streets and divided highways, flashing light signals shall be placed on the approach side of the highway-rail grade crossing on both sides of the roadway or shall be placed above the highway.

Each red signal unit in the flashing-light signal shall flash alternately. The number of flashes per minute for each lamp shall be 35 minimum and 65 maximum. Each lamp shall be illuminated approximately the same length of time. Total time of illumination of each pair of lamps shall be the entire operating time. Flashing-light units shall use either 8 inch or 12 inch nominal diameter lenses.

Guidance:

In choosing between the 8 inch or 12 inch nominal diameter lenses for use in highway-rail grade crossing flashing-light signals, consideration should be given to the principles stated in Section 4D.15.

**Standard:**

Highway-rail grade crossing flashing-light signals shall operate at a low voltage using storage batteries either as a primary or stand-by source of electrical energy. Provision shall be made to provide a source of energy for charging batteries.

Option:

Additional pairs of flashing-light units may be mounted on the same supporting post and directed toward vehicular traffic approaching the highway-rail grade crossing from other than the principal highway route, such as where there are approaching routes on highways closely adjacent to and parallel to the railroad.

### **Section 8D.03 Flashing-Light Signals, Overhead Structures**

Option:

Flashing-light signals may be installed on overhead structures or cantilevered supports as shown in Figure 8D-1 where needed for additional emphasis, or for better visibility to approaching traffic, particularly on multi-lane approaches or highways with profile restrictions.

If it is determined by an engineering study that one set of flashing lights on the cantilever arm is not sufficiently visible to road users, one or more additional sets of flashing lights may be mounted on the supporting post and/or on the cantilever arm.

**Standard:**

Breakaway or frangible bases shall not be used for overhead structures or cantilevered supports.

### **Section 8D.04 Automatic Gates**

Support:

An automatic gate is a traffic control device used as an adjunct to flashing-light signals.

**Standard:**

The automatic gate (see Figure 8D-1) shall consist of a drive mechanism and a fully retroreflectorized red- and white-striped gate arm with lights. When in the down position, the gate arm shall extend across the approaching lanes of highway traffic.

In the normal sequence of operation, unless constant warning time or other advanced system requires otherwise, the flashing-light signals and the lights on the gate arm (in its normal upright position) shall be activated immediately upon detection of the approaching train. The gate arm shall start its downward motion not less than 3 seconds after the flashing-light signals start to operate, shall reach its horizontal position at least 5 seconds before the arrival of the train, and shall remain in the down position as long as the train occupies the highway-rail grade crossing.

When the train clears the highway-rail grade crossing, and if no other train is detected, the gate arm shall ascend to its upright position, following which the flashing lights and the lights on the gate arm shall cease operation.

Gate arms shall be fully retroreflectorized on both sides, have 45-degree diagonal stripes alternately red and white at 16 inch intervals measured horizontally, and shall have at least three red lights as indicated in Figure 8D-1.

When activated, the gate arm light nearest the tip shall be illuminated continuously and the other lights shall flash alternately in unison with the flashing-light signals.

The entrance gate arm mechanism shall be designed to fail safe in the down position.

**Guidance:**

The gate arm should ascend to its upright position in not more than 12 seconds.

In its normal upright position, when no train is approaching or occupying the highway-rail grade crossing, the gate arm should be either vertical or nearly so (see Figure 8D-1).

In the design of individual installations, consideration should be given to timing the operation of the gate arm to accommodate large and/or slow-moving vehicles.

The gates should cover the approaching highway to block all motor vehicles from being driven around the gate without crossing the centerline.

**Option:**

Automatic gate installations may include median islands between opposing lanes on an approach to a highway-rail grade crossing.

Where gates are located in the median, additional median width may be required to provide the minimum clearance for the counterweight supports.

**Section 8D.05 Four-Quadrant Gate Systems****Option:**

Four-Quadrant Gate systems may be installed to improve safety at highway-rail grade crossings based on an engineering study when less restrictive measures, such as automatic gates and median islands, are not effective.

**Standard:**

**A Four-Quadrant Gate system shall consist of a series of automatic gates used as an adjunct to flashing-light signals to control traffic on all lanes entering and exiting the highway-rail grade crossing.**

**The Four-Quadrant Gate system shall consist of a drive mechanism and fully retroreflectorized red- and white-striped gate arms with lights, and when in the down position the gate arms extend individually across the entrance and exit lanes of highway traffic as shown in Figure 8D-2. Standards contained in Sections 8D.01 through 8D.03 for flashing-light signals shall be followed for signal specifications, location, and clearance distances.**

**In the normal sequence of operation, unless constant warning time or other advanced system requires otherwise, the flashing-light signals and the lights on the gate arms (in their normal upright positions) shall be activated immediately upon detection of the approaching train. The gate arms for the entrance lanes of traffic shall start their downward motion not less than 3 seconds after the flashing-light signals start to operate and shall reach their horizontal position at least 5 seconds before the arrival of the train. Exit gate arm activation and downward motion shall be based on detection or timing requirements established by an engineering study of the individual site. The gate arms shall remain in the down position as long as the train occupies the highway-rail grade crossing.**

**When the train clears the highway-rail grade crossing, and if no other train is detected, the gate arms shall ascend to their upright positions, following which the flashing lights and the lights on the gate arms shall cease operation.**

**Gate arm design, colors, and lighting requirements shall be in accordance with the Standards contained in Section 8D.04.**

**Except as noted in the Option below, the exit gate arm mechanism shall be designed to fail-safe in the up position.**

**At locations where gate arms are offset a sufficient distance for vehicles to drive between the entrance and exit gate arms, median islands shall be installed in accordance with the needs established by an engineering study.**

**Guidance:**

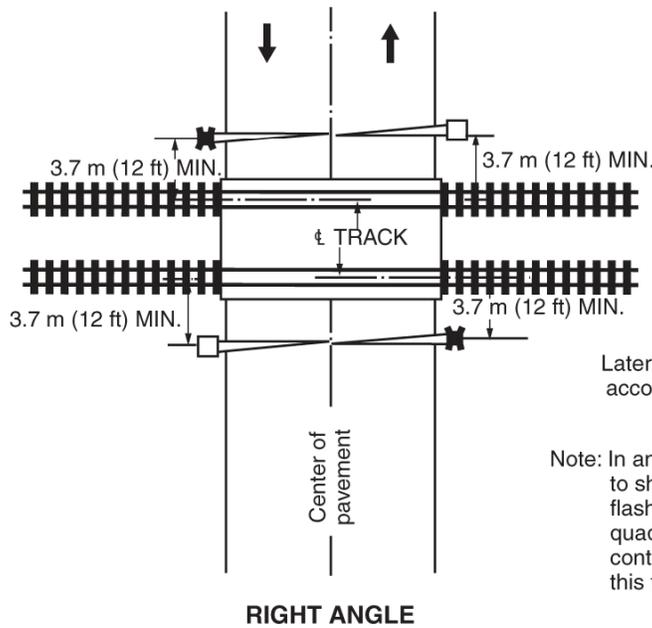
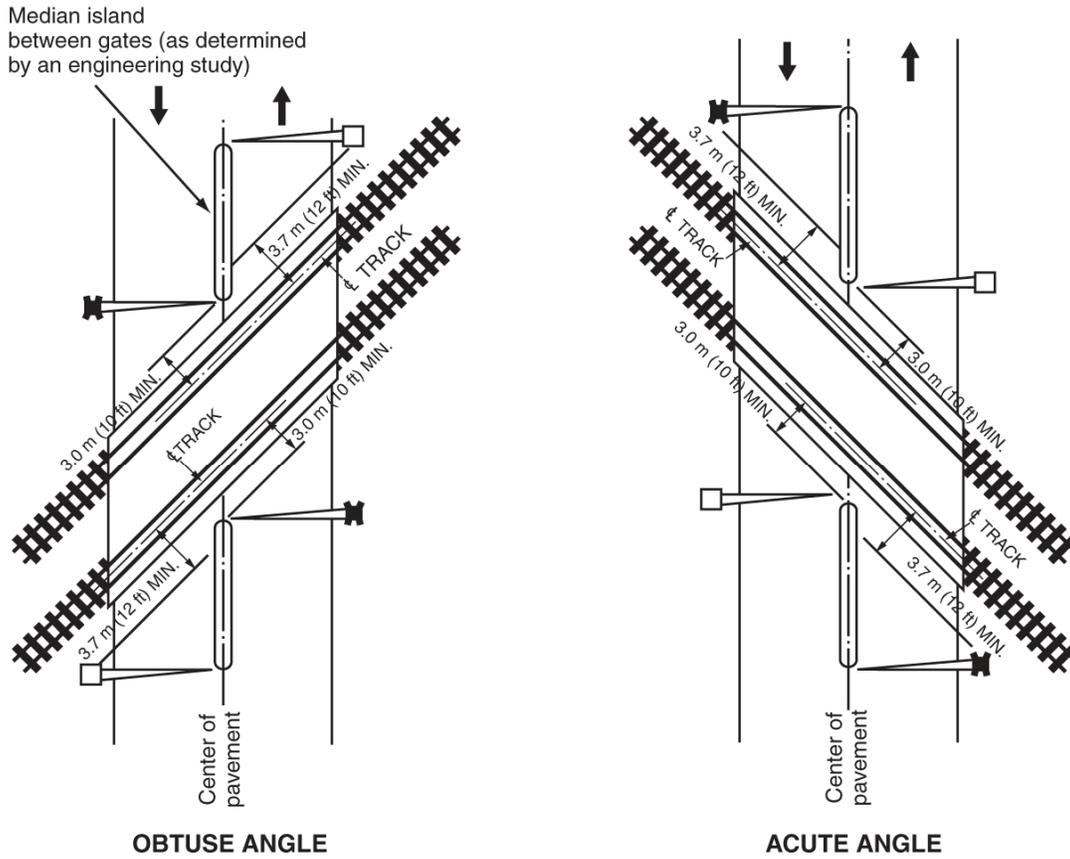
The gate arm should ascend to its upright position in not more than 12 seconds.

Four-Quadrant Gate systems should only be used in locations with constant-warning-time train detection.

The operating mode of the exit gates should be determined based upon an engineering study, with input from the affected railroad company.

If the Timed Exit Gate Operating Mode is used, the engineering study, with input from the affected railroad company, should also determine the Exit Gate Clearance Time (see Section 8A.01).

**Figure 8D-2. Example of Location Plan for Flashing-Light Signals and Four-Quadrant Gates**



Legend  
 → Direction of travel

Lateral clearances shall be in accordance with Figure 8D-1 and Chapter 8D.

Note: In an effort to simplify the figure to show typical location plans for flashing-light signals and four-quadrant gates, not all traffic control devices are shown on this figure.

If the Dynamic Exit Gate Operating Mode is used, vehicle intrusion detection devices should be installed to control exit gate operation based on vehicle presence within the minimum track clearance distance.

Regardless of which exit gate operating mode is used, the Exit Gate Clearance Time should be considered when determining additional time requirements for the Minimum Warning Time.

If a Four-Quadrant Gate system is used at a location that is adjacent to an intersection that could cause vehicles to queue within the minimum track clearance distance, the Dynamic Exit Gate Operating Mode should be used unless an engineering study indicates otherwise.

If a Four-Quadrant Gate system is interconnected with a highway traffic signal, backup or standby power should be considered for the highway traffic signal. Also, circuitry should be installed to prevent the highway traffic signal from leaving the track clearance green interval until all of the gates are lowered.

At locations where sufficient space is available, exit gates should be set back from the track a distance that provides a safety zone long enough to accommodate at least one design vehicle between the exit gate and the nearest rail.

Four-Quadrant Gate systems should include remote health (status) monitoring capable of automatically notifying railroad signal maintenance personnel when anomalies have occurred within the system.

Option:

Exit gate arms may fail in the down position if the highway-rail grade crossing is equipped with remote health (status) monitoring.

Four-Quadrant Gate installations may include median islands between opposing lanes on an approach to a highway-rail grade crossing.

Guidance:

Where sufficient space is available, median islands should be at least 18 m (60 ft) in length.

### **Section 8D.06 Train Detection**

**Standard:**

**The devices employed in active traffic control systems shall be actuated by some form of train detection.**

**Train detection circuits, insofar as practical, shall be designed on the fail-safe principle.**

**Flashing-light signals shall operate for at least 20 seconds before the arrival of any train, except as noted in the Option below.**

Option:

On tracks where all trains operate at less than 20 mph and where flagging is performed by an employee on the ground, a shorter signal operating time for the flashing-light signals may be used.

Additional warning time may be provided when determined by an engineering study.

Guidance:

Where the speeds of different trains on a given track vary considerably under normal operation, special devices or circuits should be installed to provide reasonably uniform notice in advance of all train movements over the highway-rail grade crossing. Special control features should be used to eliminate the effects of station stops and switching operations within approach control circuits to prevent excessive activation of the traffic control devices while trains are stopped on or switching upon the approach track control circuits.

### **Section 8D.07 Traffic Control Signals at or Near Highway-Rail Grade Crossings**

Option:

Traffic control signals may be used instead of flashing-light signals to control road users at industrial highway-rail grade crossings and other places where train movements are very slow, such as in switching operations.

**Standard:**

**The appropriate provisions of Part 4 relating to traffic control signal design, installation, and operation shall be applicable where traffic control signals are used to control road users instead of flashing-light signals at highway-rail grade crossings.**

**Traffic control signals shall not be used instead of flashing-light signals to control road users at a mainline highway-rail grade crossing.**

**Guidance:**

The highway agency with jurisdiction, the regulatory agency with statutory authority, if applicable, and the railroad company should jointly determine the preemption operation at highway-rail grade crossings adjacent to signalized highway intersections.

If a highway-rail grade crossing is equipped with a flashing-light signal system and is located within 200 ft of an intersection or midblock location controlled by a traffic control signal, the traffic control signal should be provided with preemption in accordance with Section 4D.13.

Coordination with the flashing-light signal system, queue detection, or other alternatives should be considered for traffic control signals located farther than 200 ft from the highway-rail grade crossing. Factors to be considered should include traffic volumes, vehicle mix, vehicle and train approach speeds, frequency of trains, and queue lengths.

**Standard:**

**If preemption is provided, the normal sequence of traffic control signal indications shall be preempted upon the approach of trains to avoid entrapment of vehicles on the highway-rail grade crossing by conflicting aspects of the traffic control signals and the highway-rail grade crossing flashing-light signals.**

**This preemption feature shall have an electrical circuit of the closed-circuit principle, or a supervised communication circuit between the control circuits of the highway-rail grade crossing warning system and the traffic control signal controller. The traffic control signal controller preemptor shall be activated via the supervised communication circuit or the electrical circuit that is normally energized by the control circuits of the highway-rail grade crossing warning system. The approach of a train to a highway-rail grade crossing shall de-energize the electrical circuit or activate the supervised communication circuit, which in turn shall activate the traffic control signal controller preemptor. This shall establish and maintain the preemption condition during the time the highway-rail grade crossing warning system is activated, except that when crossing gates exist, the preemption condition shall be maintained until the crossing gates are energized to start their upward movement. When multiple or successive preemptions occur, train activation shall receive first priority.**

**Guidance:**

If a highway-rail grade crossing is located within 50 ft (or within 75 ft for a highway that is regularly used by multi-unit vehicles) of an intersection controlled by a traffic control signal, the use of pre-signals to control traffic approaching the grade crossing should be considered.

**Standard:**

**If used, the pre-signals shall display a red signal indication during the track clearance portion of a signal preemption sequence to prohibit additional vehicles from crossing the railroad track.**

**Guidance:**

Consideration should be given to using visibility-limited signal faces (see Section 4A.02) at the intersection for the downstream signal faces that control the approach that is equipped with pre-signals.

**Option:**

The pre-signal phase sequencing may be timed with an offset from the signalized intersection such that the railroad track area and the area between the railroad track and the downstream signalized intersection is generally kept clear of stopped vehicles.

**Standard:**

**If a pre-signal is installed at an interconnected highway-rail grade crossing near a signalized intersection, a STOP HERE ON RED (R10-6) sign shall be installed near the pre-signal or at the stop line if used. If there is a nearby signalized intersection with insufficient clear storage distance for a design vehicle, or the highway-rail grade crossing does not have gates, a NO TURN ON RED (R10-11) sign shall be installed for the approach that crosses the railroad track.**

**Option:**

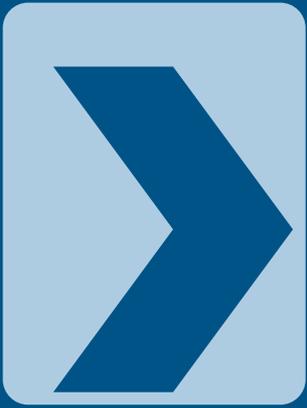
At locations where a highway-rail grade crossing is located more than 50 ft (or more than 75 ft for a highway regularly used by multi-unit vehicles) from an intersection controlled by a traffic control signal, a pre-signal may be used if an engineering study determines a need.

If highway traffic signals must be located within close proximity to the flashing-light signal system, the highway traffic signals may be mounted on the same overhead structure as the flashing-light signals.

**Support:**

Section 4D.13 describes additional considerations regarding preemption of traffic control signals at or near highway-rail grade crossings.

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Delaware Department of Transportation  
**Manual on Uniform Traffic  
Control Devices (MUTCD)**  
for Streets and Highways

# PART 9

## TRAFFIC CONTROLS FOR BICYCLE FACILITIES





<u>Legend</u>
DeIDOT Revision

## PART 9. TRAFFIC CONTROLS FOR BICYCLE FACILITIES

### TABLE OF CONTENTS

	<u>Page</u>
<b>CHAPTER 9A. GENERAL</b>	
Section 9A.01	Requirements for Bicyclist Traffic Control Devices ..... 9A-1
Section 9A.02	Scope ..... 9A-1
Section 9A.03	Definitions Relating to Bicycles ..... 9A-1
Section 9A.04	Maintenance ..... 9A-1
Section 9A.05	Relation to Other Documents ..... 9A-2
Section 9A.06	Placement Authority ..... 9A-2
Section 9A.07	Meaning of Standard, Guidance, Option, and Support ..... 9A-2
Section 9A.08	Colors ..... 9A-2
<b>CHAPTER 9B. SIGNS</b>	
Section 9B.01	Application and Placement of Signs ..... 9B-1
Section 9B.02	Design of Bicycle Signs ..... 9B-1
Section 9B.03	STOP and YIELD Signs (R1-1, R1-2) ..... 9B-1
Section 9B.04	Bicycle Lane Signs (R3-17, R3-17a, R3-17b) ..... 9B-2
Section 9B.05	BEGIN RIGHT TURN LANE YIELD TO BIKES Sign (R4-4) ..... 9B-3
Section 9B.06	Bicycle WRONG WAY sign and RIDE WITH TRAFFIC Plaque (R5-1b, R9-3c) ..... 9B-7
Section 9B.07	NO MOTOR VEHICLES Sign (R5-3) ..... 9B-7
Section 9B.08	No Bicycles Sign (R5-6) ..... 9B-7
Section 9B.09	No Parking BIKE LANE Signs (R7-9, R7-9a) ..... 9B-7
Section 9B.10	Bicycle Regulatory Signs (R9-5, R9-6, R10-3) ..... 9B-7
Section 9B.11	Shared-Use Path Restriction Sign (R9-7) ..... 9B-7
Section 9B.12	Bicycle Signal Actuation Sign (R10-22) ..... 9B-7
Section 9B.13	Other Regulatory Signs ..... 9B-8
Section 9B.14	Turn or Curve Warning Signs (W1 Series) ..... 9B-8
Section 9B.15	Intersection Warning Signs (W2 Series) ..... 9B-8
Section 9B.16	Bicycle Surface Condition Warning Sign (W8-10) ..... 9B-8
Section 9B.17	Bicycle Warning Sign (W11-1) ..... 9B-8
Section 9B.18	Other Bicycle Warning Signs ..... 9B-11
Section 9B.19	Bicycle Route Guide Signs (D11-1) ..... 9B-11
Section 9B.20	Bicycle Route Signs (M1-8, M1-9) ..... 9B-12
Section 9B.21	Destination Arrow and Supplemental Plaque Signs for Bicycle Route Signs ..... 9B-17
Section 9B.22	Bicycle Parking Area Sign (D4-3) ..... 9B-17
<b>CHAPTER 9C. MARKINGS</b>	
Section 9C.01	Functions of Markings ..... 9C-1
Section 9C.02	General Principles ..... 9C-1
Section 9C.03	Marking Patterns and Colors on Shared-Use Paths ..... 9C-1
Section 9C.04	Markings for Bicycle Lanes ..... 9C-7
Section 9C.05	Bicycle Detector Symbol ..... 9C-7
Section 9C.06	Pavement Markings for Obstructions ..... 9C-7
<b>CHAPTER 9D. SIGNALS</b>	
Section 9D.01	Application ..... 9D-1
Section 9D.02	Signal Operations for Bicycles ..... 9D-1

**FIGURES**

**CHAPTER 9B. SIGNS**

Figure 9B-1	Sign Placement on Shared-Use Paths.....	9B-4
Figure 9B-2	Regulatory Signs for Bicycle Facilities.....	9B-6
Figure 9B-3	Warning Signs for Bicycle Facilities .....	9B-10
Figure 9B-4	Guide Signs for Bicycle Facilities.....	9B-12
Figure 9B-5	Example of Signing for the Beginning and End of a Designated Bicycle Route on a Shared-Use Path .....	9B-13
Figure 9B-6	Example of Signing for an On-Roadway Bicycle Route.....	9B-14
Figure 9B-7	Examples of Signing and Markings for Shared-Use Paths .....	9B-15
Figure 9B-7a	Examples of Signing and Marking for Designated Bicycle Paths at Mid-Block Crossings.....	9B-16

**CHAPTER 9C. MARKINGS**

Figure 9C-1	Example of Intersection Pavement Markings—Designated Bicycle Lane with Left- Turn Area, Heavy Turn Volumes, Parking, One-Way Traffic, or Divided Highway.....	9C-2
Figure 9C-1a	Example of Intersection Pavement Markings – Designated Bicycle Lane with Right- Turn Area, Right Lane Drop .....	9C-3
Figure 9C-1b	Example of Intersection Pavement Markings – Designated Bicycle Lane at Intersection Departures with and without Acceleration Lanes.....	9C-4
Figure 9C-1c	Example of Designated Bicycle Lane Crossing at High Speed Entrance Ramp.....	9C-5
Figure 9C-2	Examples of Centerline Markings for Shared-Use Paths .....	9C-6
Figure 9C-3	Example of Bicycle Lane Treatment at a Right Turn Only Lane.....	9C-8
Figure 9C-3a	Example of Bicycle Lane Treatment at a Right Turn Only Lane with Shoulder .....	9C-9
Figure 9C-4	Example of Bicycle Lane Treatment at Parking Lane into a Right Turn Only Lane .....	9C-10
Figure 9C-5	Example of Pavement Markings for Bicycle Lanes on a Two-Way Street.....	9C-11
Figure 9C-6	Example of Optional Word and Symbol Pavement Markings for Bicycle Lanes .....	9C-12
Figure 9C-7	Example of Bicycle Detector Pavement Marking.....	9C-13
Figure 9C-8	Example of Obstruction Pavement Marking .....	9C-13

**TABLES**

**CHAPTER 9B. SIGNS**

Table 9B-1	Minimum Sign Sizes for Bicycle Facilities.....	9B-4
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## CHAPTER 9A. GENERAL

### Section 9A.01 Requirements for Bicyclist Traffic Control Devices

Support:

General information and definitions concerning traffic control devices are found in Part 1.

### Section 9A.02 Scope

Support:

Part 9 covers signs, pavement markings, and highway traffic signals specifically related to bicycle operation on both roadways and shared-use paths.

Guidance:

Parts 1, 2, 3, and 4 should be reviewed for general provisions, signs, pavement markings, and signals. Shared-use trail crossings should be treated as the more restrictive type of pedestrian crossing, using the appropriate signage and pavement markings for a pedestrian crossing.

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**Standard:**

**None of the bikeway designations in this Manual shall be construed to preclude permitted bicycle travel on roadways or portions of roadways that do not have bikeway designations.**

### Section 9A.03 Definitions Relating to Bicycles

**Standard:**

The following terms shall be defined as follows when used in Part 9:

1. **Bicycle Facilities**—a general term denoting improvements and provisions that accommodate or encourage bicycling, including parking and storage facilities, and shared roadways not specifically defined for bicycle use.
2. **Bicycle Lane**—a portion of a roadway that has been designated by signs and pavement markings for preferential or exclusive use by bicyclists.
3. **Bikeway**—a generic term for any road, street, path, or way that in some manner is specifically designated for bicycle travel, regardless of whether such facilities are designated for the exclusive use of bicycles or are to be shared with other transportation modes.
4. **Designated Bicycle Route**—a system of bikeways designated by the jurisdiction having authority with appropriate directional and informational route signs, with or without specific bicycle route numbers. Bicycle routes, which might be a combination of various types of bikeways, should establish a continuous routing.
5. **Shared-Use Path**—a bikeway outside the traveled way and physically separated from motorized vehicular traffic by an open space or barrier and either within the highway right-of-way or within an independent alignment. Shared-use paths are also used by pedestrians (including skaters, users of manual and motorized wheelchairs, and joggers) and other authorized motorized and non-motorized users.

### Section 9A.04 Maintenance

Guidance:

All signs, signals, and markings, including those on bicycle facilities, should be properly maintained to command respect from both the motorist and the bicyclist. When installing signs and markings on bicycle facilities, an agency should be designated to maintain these devices.

**Section 9A.05 Relation to Other Documents**

Support:

“The Uniform Vehicle Code and Model Traffic Ordinance” published by the National Committee on Uniform Traffic Laws and Ordinances (see Section 1A.11) has provisions for bicycles and is the basis for the traffic control devices included herein.

Informational documents used during the development of the signing and marking recommendations in Part 9 include the following:

- A. “Guide for Development of Bicycle Facilities,” which is available from the American Association of State Highway and Transportation Officials (see Page i for the address);
- B. State and local government design guides; and
- C. “Selecting Roadway Design Treatments to Accommodate Bicycles,” FHWA Publication No. FHWA-RD-92-073, which is available from the FHWA Research and Technology Report Center, 9701 Philadelphia Court, Unit Q, Lanham, MD 20106.

Other publications that relate to the application of traffic control devices in general are listed in Section 1A.11.

**Section 9A.06 Placement Authority**

Support:

Section 1A.08 contains information regarding placement authority for traffic control devices.

**Section 9A.07 Meaning of Standard, Guidance, Option, and Support**

Support:

The introduction to this Manual contains information regarding the meaning of the headings Standard, Guidance, Option, and Support, and the use of the words shall, should, and may.

**Section 9A.08 Colors**

Support:

Section 1A.12 contains information regarding the color codes.

## CHAPTER 9B. SIGNS

### Section 9B.01 Application and Placement of Signs

#### Standard:

Bicycle signs shall be standard in shape, legend, and color.

All signs shall be retroreflectorized for use on bikeways, including shared-use paths and bicycle lane facilities.

Where signs serve both bicyclists and other road users, vertical mounting height and lateral placement shall be as specified in Part 2.

On shared-use paths, lateral sign clearance shall be a minimum of 0.9 m (3 ft) and a maximum of 1.8 m (6 ft) from the near edge of the sign to the near edge of the path (see Figure 9B-1).

Mounting height for ground-mounted signs on shared-use paths shall be a minimum of 1.2 m (4 ft) and a maximum of 1.5 m (5 ft), measured from the bottom edge of the sign to the near edge of the path surface (see Figure 9B-1).

When overhead signs are used on shared-use paths, the clearance from the bottom edge of the sign to the path surface directly under the sign shall be a minimum of 2.4 m (8 ft).

#### Guidance:

Signs for the exclusive use of bicyclists should be located and/or sized so that other road users are not confused by them.

The clearance for overhead signs on shared-use paths should be adjusted when appropriate to accommodate typical maintenance vehicles.

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### Section 9B.02 Design of Bicycle Signs

#### Standard:

If the sign applies to motorists and bicyclists, then the size shall be as shown for conventional roads in Table 2B-1.

The minimum sign sizes for shared-use paths shall be those shown in Table 9B-1, and shall be used only for signs installed specifically for bicycle traffic applications. The minimum sign sizes for bicycle facilities shall not be used for signs that are placed in a location that would have any application to other vehicles.

#### Option:

Larger size signs may be used on bicycle facilities when appropriate.

#### Guidance:

Except for size, the design of signs for bicycle facilities should be identical to that specified in this Manual for vehicular travel.

#### Support:

Uniformity in design includes shape, color, symbols, wording, lettering, and illumination or retroreflectorization.

### Section 9B.03 STOP and YIELD Signs (R1-1, R1-2)

#### Standard:

STOP (R1-1) signs (see Figure 9B-2) shall be installed on shared-use paths at points where bicyclists are required to stop.

YIELD (R1-2) signs (see Figure 9B-2) shall be installed on shared-use paths at points where bicyclists have an adequate view of conflicting traffic as they approach the sign, and where bicyclists are required to yield the right-of-way to that conflicting traffic.

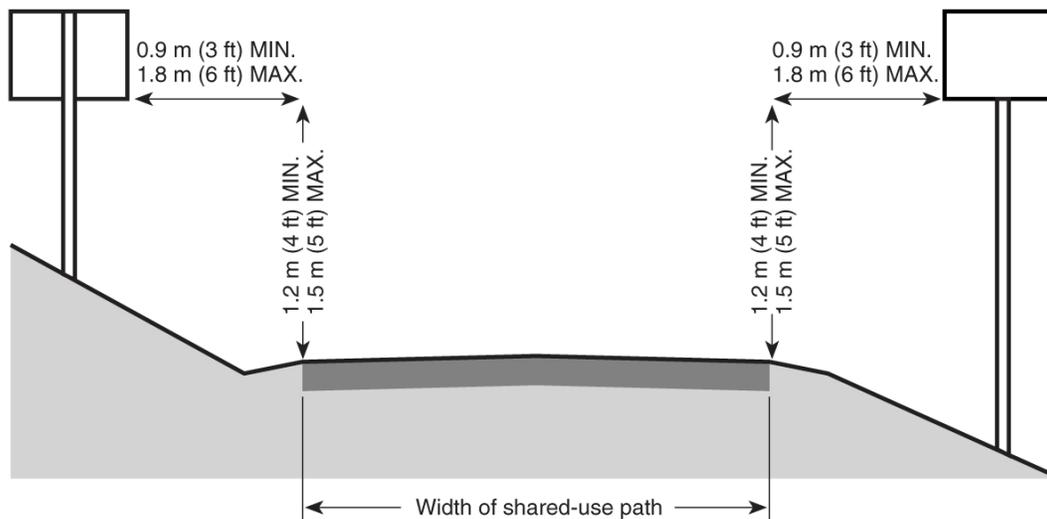
#### Option:

A (30 x 30 in) STOP sign or a (36 x 36 x 36 in) YIELD sign may be used on shared-use paths for added emphasis.

#### Guidance:

Where conditions require path users, but not roadway users, to stop or yield, the STOP sign or YIELD sign should be placed or shielded so that it is not readily visible to road users.

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**Figure 9B-1. Sign Placement on Shared-Use Paths**

When placement of STOP or YIELD signs is considered, priority at a shared-use path/roadway intersection should be assigned with consideration of the following:

- Relative speeds of shared-use path and roadway users;
- Relative volumes of shared-use path and roadway traffic; and
- Relative importance of shared-use path and roadway.

Speed should not be the sole factor used to determine priority, as it is sometimes appropriate to give priority to a high-volume shared-use path crossing a low-volume street, or to a regional shared-use path crossing a minor collector street.

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In situations where a shared use path intersects with a roadway in a manner that a STOP or YIELD sign for bicyclists may be seen or confused by motorists, a STOP (SR1-16 DE) or YIELD (SR1-17 DE) sign for bicyclists should be used.

When priority is assigned, the least restrictive control that is appropriate should be placed on the lower priority approaches. STOP signs should not be used where YIELD signs would be acceptable.

#### **Section 9B.04 Bicycle Lane Signs (R3-17, R3-17a, R3-17b)**

##### **Standard:**

The BIKE LANE (R3-17) sign (see Figure 9B-2) shall be used only in conjunction with marked bicycle lanes as described in Section 9C.04, and shall be placed at periodic intervals along the bicycle lanes.

##### **Guidance:**

The BIKE LANE (R3-17) sign spacing should be determined by engineering judgment based on prevailing speed of bicycle and other traffic, block length, distances from adjacent intersections, and other considerations.

The AHEAD (R3-17a) sign (see Figure 9B-2) should be mounted directly below a R3-17 sign in advance of the beginning of a marked bicycle lane.

The ENDS (R3-17b) sign (see Figure 9B-2) should be mounted directly below a R3-17 sign at the end of a marked bicycle lane.

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Spacing of BIKE LANE (R3-17) signs is subject to engineering judgment and site specific constraints; however, as a general guide, in urban areas, and in rural areas with minimal access, spacing should be determined using the formula  $L = 2WS$ , where  $L$  is the spacing between signs,  $W$  is the width of the roadway, and  $S$  is the 85<sup>th</sup>-percentile speed.

##### **Option:**

On roads where isolated intersections include a bicycle lane, but there is no continuous bike lane along the road between intersections, BIKE LANE signs may be used.

**Section 9B.05 BEGIN RIGHT TURN LANE YIELD TO BIKES Sign (R4-4)****Option:**

Where motor vehicles entering an exclusive right-turn lane must weave across bicycle traffic in bicycle lanes, the BEGIN RIGHT TURN LANE YIELD TO BIKES (R4-4) sign (see Figure 9B-2) may be used to inform both the motorist and the bicyclist of this weaving maneuver.

**Guidance:**

Refer to Figures 9C-1, 9C-3, 9C-3a, and 9C-4 for examples of placement of the R4-4 sign in situations where motor vehicles must weave across bicycle traffic in bicycle lanes.

The R4-4 sign should not be used when bicyclists need to move left because of a right-turn lane drop situation. Refer to Figure 9C-1a for an example of placement of the R4-4 sign for this specific case.

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**Table 9B-1. Minimum Sign Sizes for Bicycle Facilities (Sheet 1 of 2)**

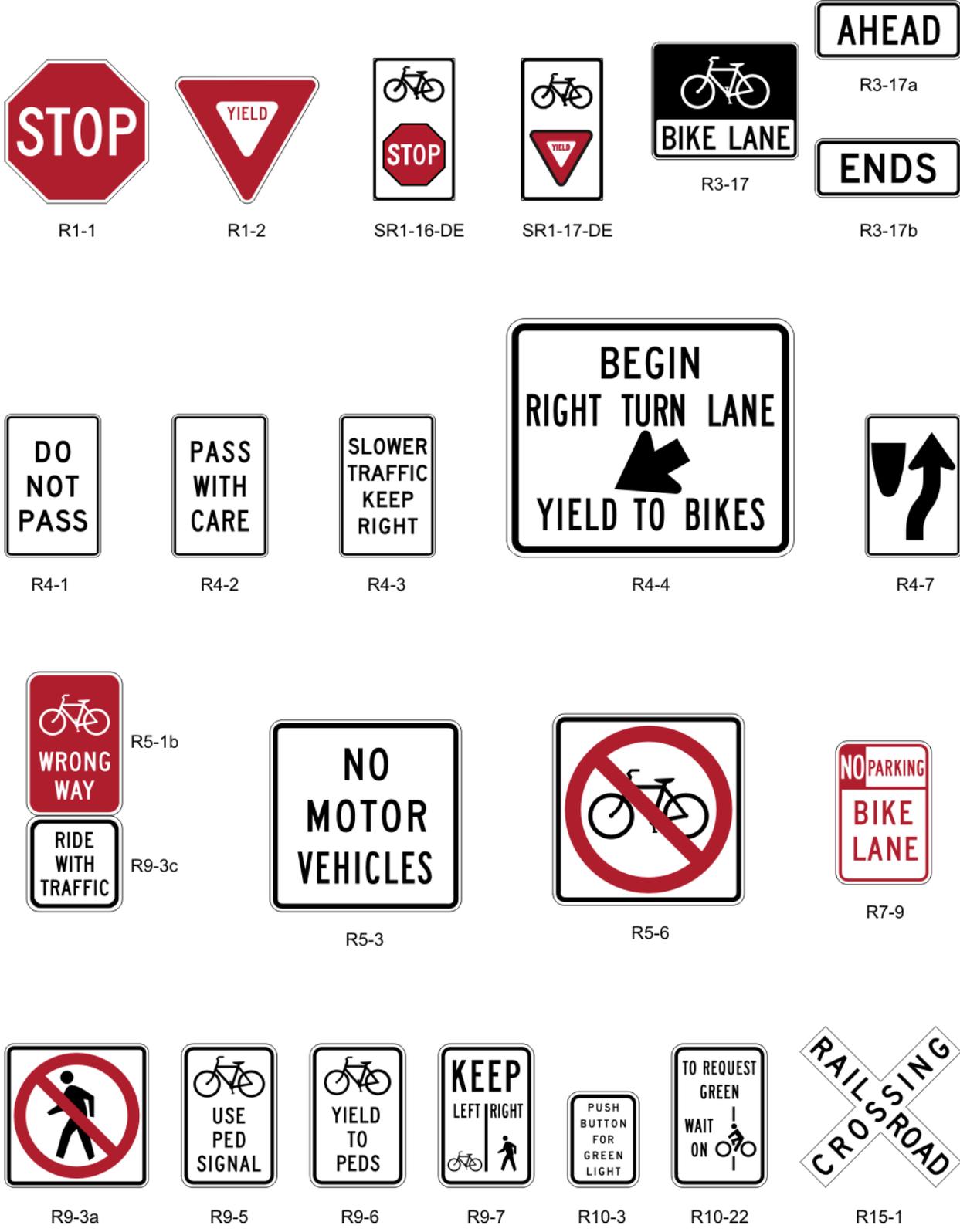
Sign	DeIDOT MUTCD Code	Minimum Sign Size – mm (in)	
		Shared-Use Path	Roadway
Stop	R1-1	450 x 450 (18 x 18)	750 x 750 (30 x 30)
Stop (Shared-Use Path Only)	SR1-16-DE	600 x 1050 (42 x 24)	---
Yield	R1-2	450 x 450 x 450 (18 x 18 x 18)	750 x 750 x 750 (30 x 30 x 30)
Yield (Shared-Use Path Only)	SR1-17-DE	600 x 1050 (42 x 24)	---
Bike Lane	R3-17	---	750 x 600 (30 x 24)
Bicycle Lane Supplemental Plaques	R3-17a, b	---	750 x 300 (30 x 12)
Movement Restriction	R4-1, 2, 3, 7	300 x 450 (12 x 18)	450 x 600 (18 x 24)
Begin Right Turn Lane Yield to Bikes	R4-4	---	900 x 750 (36 x 30)
Bicycle Wrong Way	R5-1b	300 x 450 (12 x 18)	300 x 450 (12 x 18)
No Motor Vehicles	R5-3	600 x 600 (24 x 24)	600 x 600 (24 x 24)
No Bicycles	R5-6	600 x 600 (24 x 24)	600 x 600 (24 x 24)
No Parking Bike Lane	R7-9	---	300 x 450 (12 x 18)
Pedestrian Prohibited	R9-3a	450 x 450 (18 x 18)	450 x 450 (18 x 18)
Ride With Traffic Plaque	R9-3c	300 x 300 (12 x 12)	300 x 300 (12 x 12)
Bicycle Regulatory	R9-5, 6	300 x 450 (12 x 18)	300 x 450 (12 x 18)
Shared-Use Path Restriction	R9-7	300 x 450 (12 x 18)	---
Push Button for Green Light	R10-3	225 x 300 (9 x 12)	225 x 300 (9 x 12)
To Request Green Wait on Symbol	R10-22	300 x 450 (12 x 18)	300 x 450 (12 x 18)
Railroad Crossbuck	R15-1	600 x 112 (24 x 4.5)	1200 x 255 (48 x 9)
Turn and Curve Warning	W1-1, 2, 3, 4, 5	450 x 450 (18 x 18)	600 x 600 (24 x 24)
Arrow Warning	W1-6, 7	600 x 300 (24 x 12)	900 x 450 (36 x 18)
Intersection Warning	W2-1, 2, 3, 4, 5	450 x 450 (18 x 18)	600 x 600 (24 x 24)
Stop, Yield, Signal Ahead	W3-1, 2, 3	450 x 450 (18 x 18)	750 x 750 (30 x 30)
Narrow Bridge	W5-2	450 x 450 (18 x 18)	750 x 750 (30 x 30)
Bikeway Narrows	W5-4a	450 x 450 (18 x 18)	750 x 750 (30 x 30)

**Table 9B-1. Minimum Sign Sizes for Bicycle Facilities (Sheet 2 of 2)**

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Sign	DeIDOT MUTCD Code	Minimum Sign Size – mm (in)	
		Shared-Use Path	Roadway
Hill	W7-5	450 x 450 (18 x 18)	600 x 600 (24 x 24)
Bump or Dip	W8-1, 2	450 x 450 (18 x 18)	600 x 600 (24 x 24)
Bicycle Surface Condition	W8-10	450 x 450 (18 x 18)	600 x 600 (24 x 24)
Bicycle Surface Condition Plaque	W8-10p	300 x 225 (12 x 9)	300 x 225 (12 x 9)
Advance Grade Crossing	W10-1	375 Dia. (15 Dia.)	375 Dia. (15 Dia.)
Skewed Bicycle-Rail Crossing	W10-12	450 x 450 (18 x 18)	600 x 600 (24 x 24)
Cycles Use Caution Plaque	W10-12p-DE	300 x 300 (12 x 12)	300 x 300 (12 x 12)
Bicycle Warning	W11-1	450 x 450 (18 x 18)	600 x 600 (24 x 24)
Bicycle Crossing Plaque	W11-1p-DE	---	600 x 450 (24 x 18)
Pedestrian Crossing	W11-2	450 x 450 (18 x 18)	600 x 600 (24 x 24)
Low Clearance	W12-2	450 x 450 (18 x 18)	750 x 750 (30 x 30)
Playground	W15-1	450 x 450 (18 x 18)	600 x 600 (24 x 24)
Share the Road Plaque	W16-1	---	450 x 600 (18 x 24)
Diagonal Arrow Plaque	W16-7p	---	600 x 300 (24 x 12)
Bicycle Guide	D1-1b	600 x 150 (24 x 6)	600 x 150 (24 x 6)
Street Name	D1-1c	450 x 150 (18 x 6)	450 x 150 (18 x 6)
Bicycle Parking	D4-3	300 x 450 (12 x 18)	300 x 450 (12 x 18)
Bike Route	D11-1	600 x 450 (24 x 18)	600 x 450 (24 x 18)
Bicycle Route Sign	M1-8-DE	300 x 450 (12 x 18)	300 x 450 (12 x 18)
Interstate Bicycle Route Sign	M1-9	450 x 600 (18 x 24)	450 x 600 (18 x 24)
Bicycle Route Supplemental Plaques	M4-11, 12, 13	300 x 100 (12 x 4)	300 x 100 (12 x 4)
Route Sign Supplemental Plaques	M7-1, 2, 3, 4, 5, 6, 7	300 x 225 (12 x 9)	300 x 225 (12 x 9)

Figure 9B-2. Regulatory Signs for Bicycle Facilities



**Section 9B.06 Bicycle WRONG WAY Sign and RIDE WITH TRAFFIC Plaque (R5-1b, R9-3c)****Option:**

The Bicycle WRONG WAY (R5-1b) sign and RIDE WITH TRAFFIC (R9-3c) plaque (see Figure 9B-2) may be placed facing wrong-way bicycle traffic, such as on the left side of a roadway.

This sign and plaque may be mounted back-to-back with other signs to minimize visibility to other traffic.

**Guidance:**

The RIDE WITH TRAFFIC plaque should be used only in conjunction with the Bicycle WRONG WAY sign, and should be mounted directly below the Bicycle WRONG WAY sign.

**Section 9B.07 NO MOTOR VEHICLES Sign (R5-3)****Option:**

The NO MOTOR VEHICLES (R5-3) sign (see Figure 9B-2) may be installed at the entrance to a shared-use path.

**Section 9B.08 No Bicycles Sign (R5-6)****Guidance:**

Where bicyclists are prohibited, the No Bicycles (R5-6) sign (see Figure 9B-2) should be installed at the entrance to the facility.

**Option:**

Where pedestrians and motor-driven cycles are also prohibited, it may be more desirable to use the R5-10a word message sign that is described in Section 2B.36.

**Section 9B.09 No Parking Bike Lane Sign (R7-9)****Standard:**

**If the installation of signs is necessary to restrict parking, standing, or stopping in a bicycle lane, appropriate signs as described in Sections 2B.39 through 2B.41, or the No Parking Bike Lane (R7-9) sign (see Figure 9B-2) shall be installed.**

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**Section 9B.10 Bicycle Regulatory Signs (R9-5, R9-6, R10-3)****Option:**

The R9-5 sign (see Figure 9B-2) may be used where the crossing of a street by bicyclists is controlled by pedestrian signal indications.

Where it is not intended for bicyclists to be controlled by pedestrian signal indications, the R10-3 sign (see Figure 9B-2 and Section 2B.45) may be used.

The R9-6 sign (see Figure 9B-2) may be used where a bicyclist is required to cross or share a facility used by pedestrians and is required to yield to the pedestrians.

**Guidance:**

If used, the R9-5 or R10-3 signs should be installed near the edge of the sidewalk in the vicinity of where bicyclists will be crossing the street.

**Section 9B.11 Shared-Use Path Restriction Sign (R9-7)****Option:**

The Shared-Use Path Restriction (R9-7) sign (see Figure 9B-2) may be installed on facilities that are to be shared by pedestrians and bicyclists. The symbols may be switched as appropriate.

A designated pavement area may be provided for each mode of travel (see Section 9C.03).

**Section 9B.12 Bicycle Signal Actuation Sign (R10-22)****Option:**

The Bicycle Signal Actuation (R10-22) sign (see Figure 9B-2) may be installed at signalized intersections where markings are used to indicate the location where a bicyclist is to be positioned to actuate the signal (see Section 9C.05).

**Guidance:**

If the Bicycle Signal Actuation sign is installed, it should be placed at the roadside adjacent to the marking to emphasize the connection between the marking and the sign.

**Section 9B.13 Other Regulatory Signs**

Option:

Other regulatory signs described in Chapter 2B may be installed on bicycle facilities as appropriate.

**Section 9B.14 Turn or Curve Warning Signs (W1 Series)**

Guidance:

To warn bicyclists of unexpected changes in shared-use path direction, appropriate turn or curve (W1-1 through W1-7) signs (see Figure 9B-3) should be used.

The W1-1 through W1-5 signs should be installed no less than 15 m (50 ft) in advance of the beginning of the change of alignment.

**Section 9B.15 Intersection Warning Signs (W2 Series)**

Option:

Intersection Warning (W2-1 through W2-5) signs (see Figure 9B-3) may be used on a roadway, street, or shared-use path in advance of an intersection to indicate the presence of an intersection and the possibility of turning or entering traffic.

Guidance:

When engineering judgment determines that the visibility of the intersection is limited on the shared-use path approach, Intersection Warning signs should be used.

Intersection Warning signs should not be used where the shared-use path approach to the intersection is controlled by a STOP sign, YIELD sign, or a traffic control signal.

**Section 9B.16 Bicycle Surface Condition Warning Sign (W8-10)**

Option:

The Bicycle Surface Condition Warning (W8-10) sign (see Figure 9B-3) may be installed where roadway or shared-use path conditions could cause a bicyclist to lose control of the bicycle.

Signs warning of other conditions that might be of concern to bicyclists, including BUMP (W8-1), DIP (W8-2), PAVEMENT ENDS (W8-3), SKEWED CROSSING (W10-12), and any other symbol or word message that describes conditions that are of concern to bicyclists, may also be used.

A supplemental plaque may be used to clarify the specific type of surface condition or emphasize the need for caution, such as the CYCLES USE CAUTION (W10-12p-DE) plaque

**Section 9B.17 Bicycle Warning Sign (W11-1)**

Support:

The Bicycle Warning (W11-1) sign (see Figure 9B-3) alerts the road user to unexpected entries into the roadway by bicyclists, and other crossing activities that might cause conflicts. These conflicts might be relatively confined, or might occur randomly over a segment of roadway.

Option:

A supplemental plaque with the legend AHEAD or XXX FEET may be used with the Bicycle Warning sign.

Guidance:

If used in advance of a specific crossing point, the Bicycle Warning sign should be placed at a distance in advance of the crossing location that conforms with the guidance given in Table 2C-4.

A shared-use trail crossing should be treated as the more restrictive pedestrian crossing, and as such, a W11-2 sign should be used and should be supplemented with a diagonal downward pointing arrow (W16-7p) plaque (see Figure 9B-3) to show the location of the crossing.

**Standard:**

**Bicycle Warning signs, when used at the location of the crossing, shall be supplemented with a diagonal downward pointing arrow (W16-7p) plaque (see Figure 9B-3) to show the location of the crossing.**

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Option:

A fluorescent yellow-green background color with a black legend and border may be used for Bicycle Warning signs and supplemental plaques.

Guidance:

When the fluorescent yellow-green background color is used, a systematic approach featuring one background color within a zone or area should be used. The mixing of standard yellow and fluorescent yellow-green backgrounds within a zone or area should be avoided.

Use of the fluorescent yellow-green background color should be applied in cases where engineering judgment indicates a need to draw special attention to the sign message.

Figure 9B-3. Warning Signs for Bicycle Facilities (Sheet 1 of 2)



W1-1



W1-2



W1-3



W1-4



W1-5



W1-6



W1-7



W2-1



W2-2



W2-3



W2-4



W2-5



W3-1



W3-2



W3-3



W5-2



W5-4a



W7-5



W8-1



W8-2



W8-10

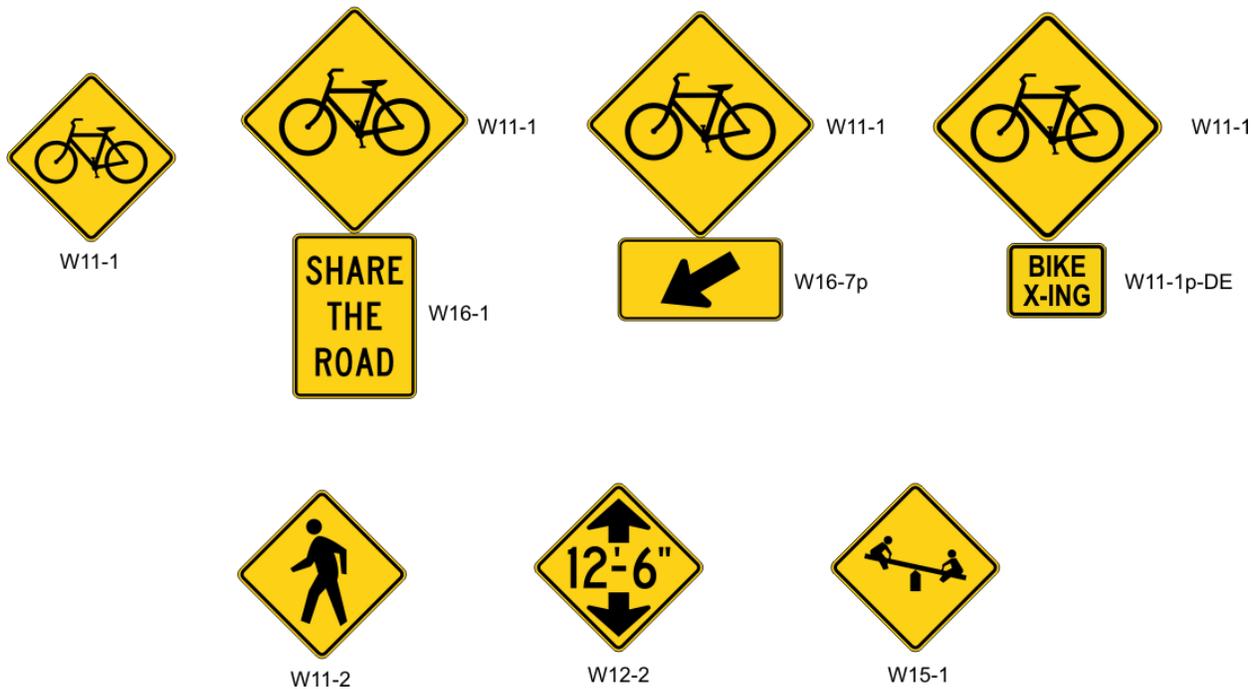


W8-10p



W10-1

**Figure 9B-3. Warning Signs for Bicycle Facilities (Sheet 2 of 2)**



**Section 9B.18 Other Bicycle Warning Signs**

Option:

Other bicycle warning signs (see Figure 9B-3) such as BIKEWAY NARROWS (W5-4a) and Hill (W7-5) may be installed on bicycle facilities to warn bicyclists of conditions not readily apparent.

In situations where there is a need to warn motorists to watch for bicyclists traveling along the highway, the SHARE THE ROAD (W16-1) plaque (see Figure 9B-3) may be used in conjunction with the W11-1 sign.

Guidance:

If used, other advance bicycle warning signs should be installed no less than 50 ft in advance of the beginning of the condition.

Where temporary traffic control zones are present on bikeways, appropriate signs from Part 6 should be used.

Option:

Other warning signs described in Chapter 2C may be installed on bicycle facilities as appropriate.

**Section 9B.19 Bicycle Route Guide Signs (D11-1)**

Guidance:

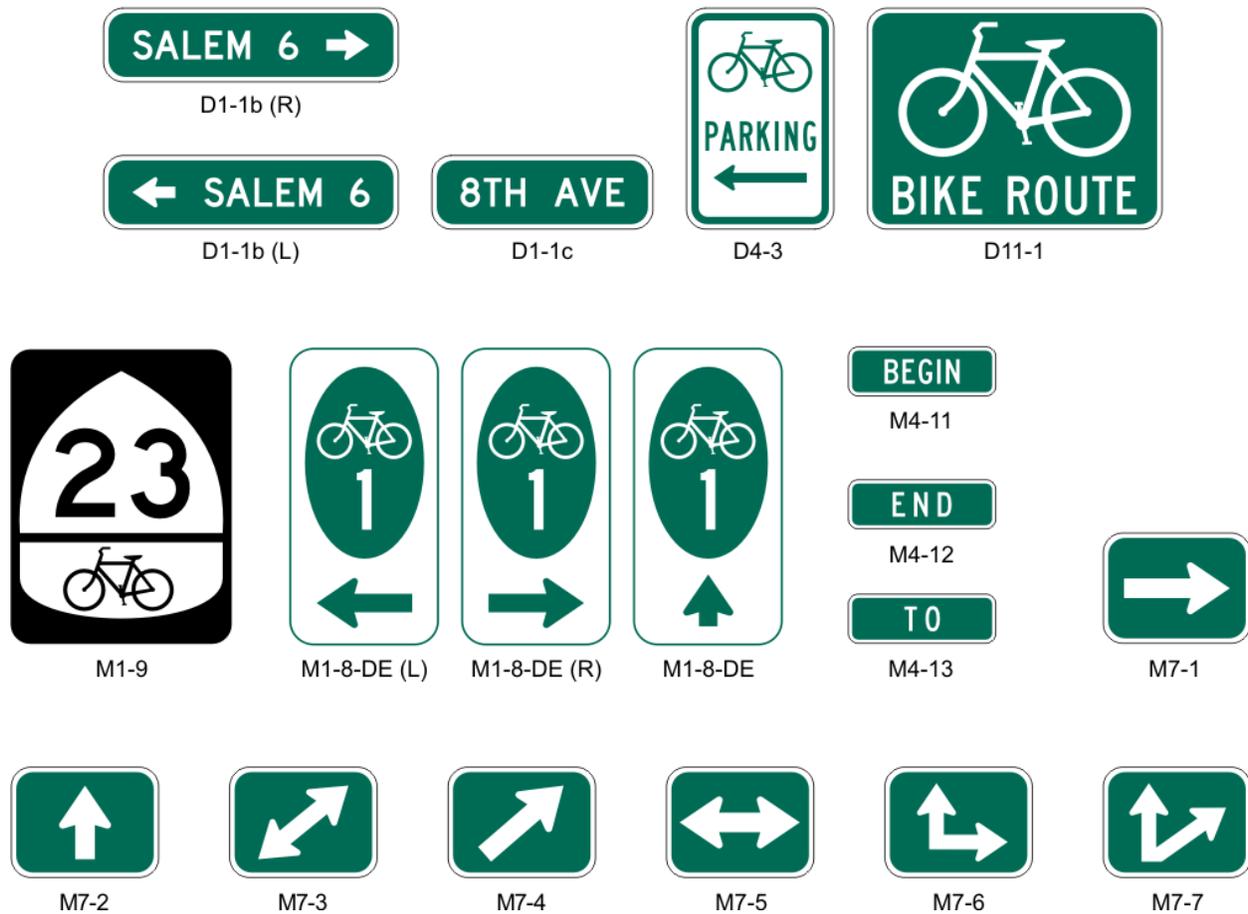
If used, Bicycle Route Guide (D11-1) signs (see Figure 9B-4) should be provided at decision points along designated bicycle routes, including signs to inform bicyclists of bicycle route direction changes and confirmation signs for route direction, distance, and destination.

If used, Bicycle Route Guide signs should be repeated at regular intervals so that bicyclists entering from side streets will have an opportunity to know that they are on a bicycle route. Similar guide signing should be used for shared roadways with intermediate signs placed for bicyclist guidance.

Support:

Figure 9B-5 shows an example of the signing for the beginning and end of a designated bicycle route on a shared-use path. Figure 9B-6 shows an example of signing for an on-roadway bicycle route. Figure 9B-7 shows examples of signing and markings for shared-use paths.

**Figure 9B-4. Guide Signs for Bicycle Facilities**



**Section 9B.20 Bicycle Route Signs (M1-8-DE, M1-9)**

Option:

To establish a unique identification (route designation) for a State or local bicycle route, the Bicycle Route (M1-8-DE) sign (see Figure 9B-4) may be used.

**Standard:**

**The Bicycle Route sign shall contain a route designation and shall have a green background with a retroreflectorized white legend and border.**

Option:

Where a designated bicycle route extends for long distances through two or more States, a coordinated submittal by the affected States for an assignment of an Interstate Bicycle Route number designation may be sent to the American Association of State Highway and Transportation Officials (see Page i for the address).

**Standard:**

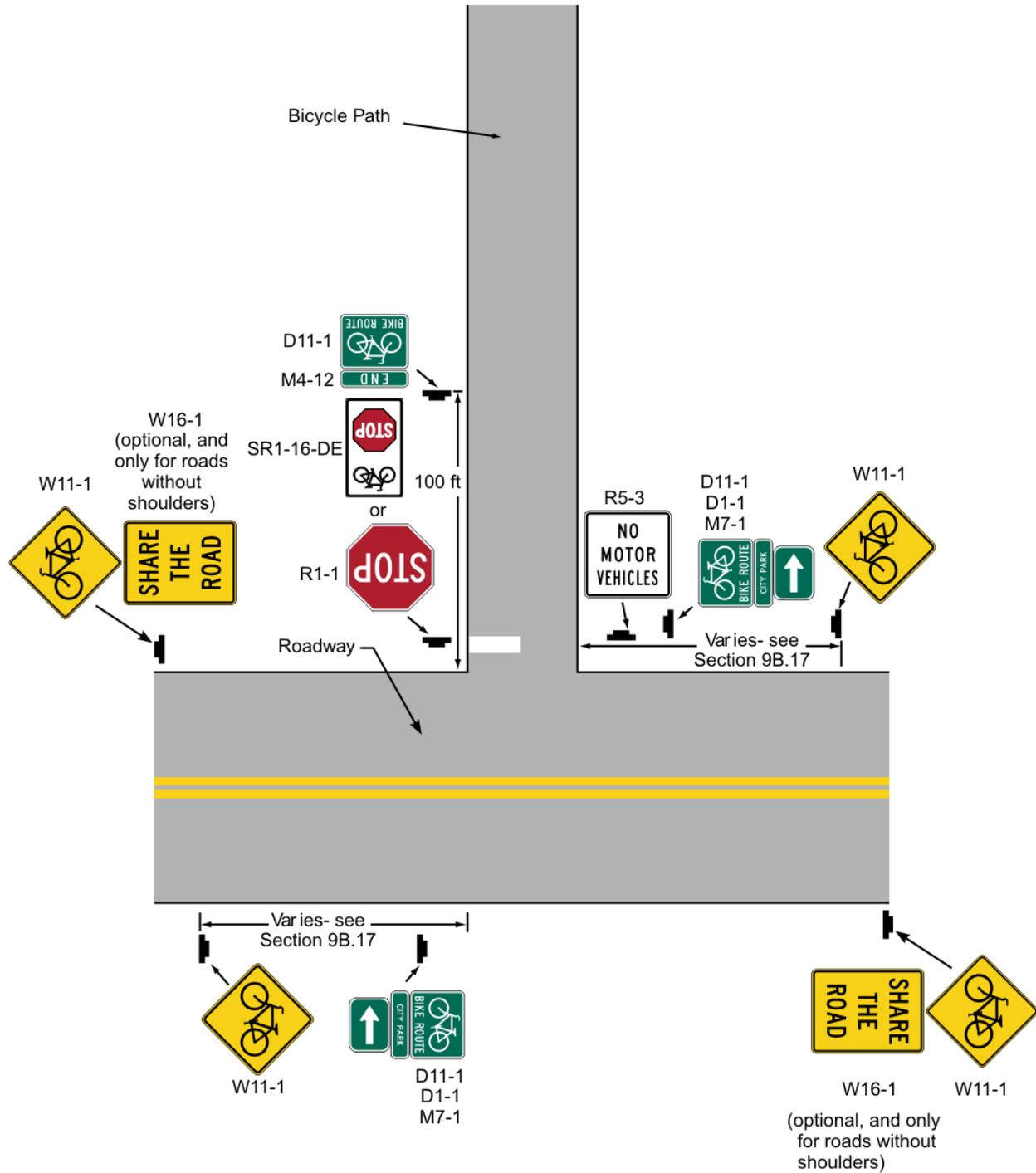
**The Interstate Bicycle Route (M1-9) sign (see Figure 9B-4) shall contain the assigned route number designation and have a black legend and border with a retroreflectorized white background.**

Guidance:

If used, the Bicycle Route or Interstate Bicycle Route signs should be placed at intervals frequent enough to keep bicyclists informed of changes in route direction and to remind motorists of the presence of bicyclists.

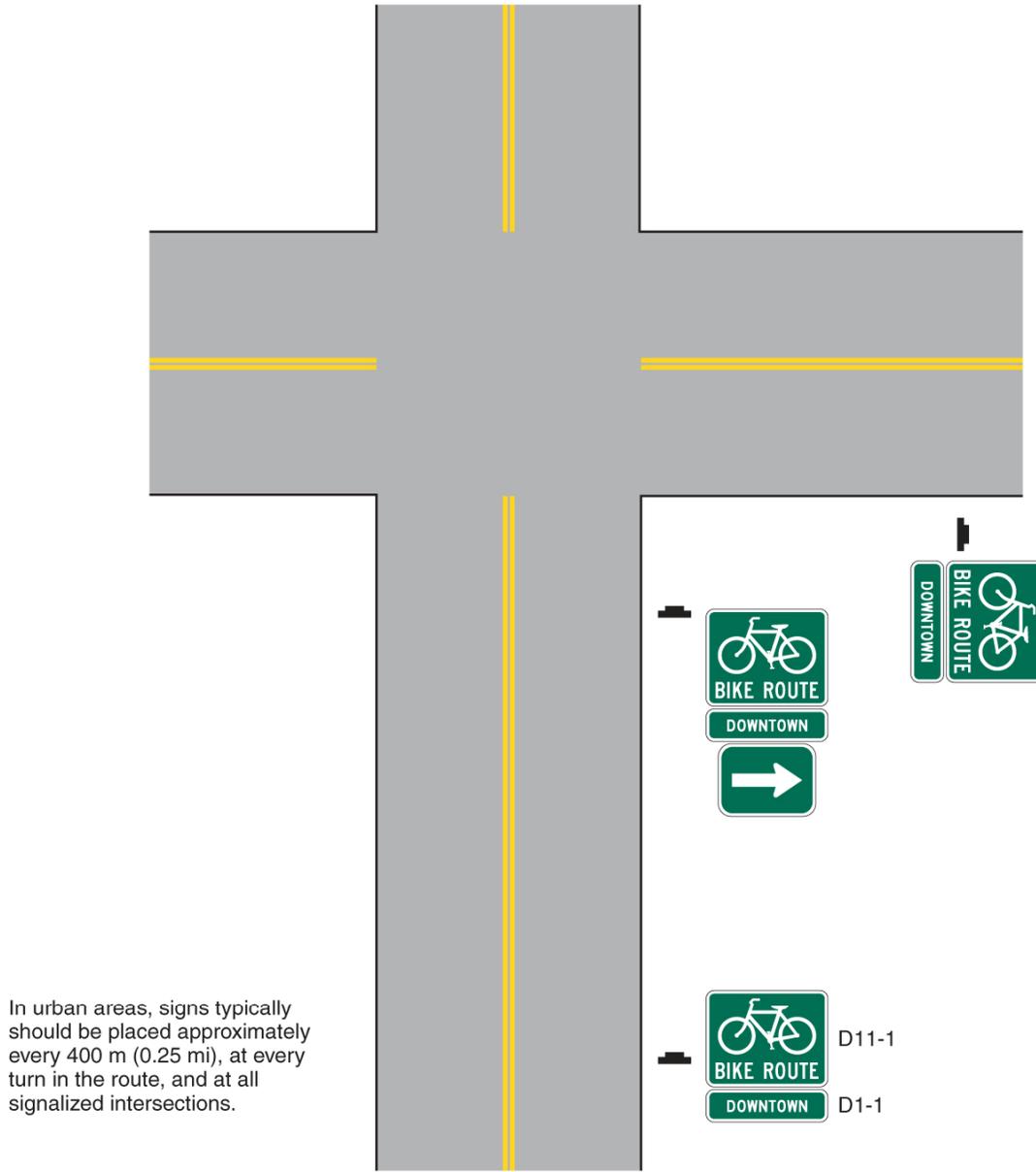
**Figure 9B-5.**  
**Example of Signing for the Beginning and End of a Designated Bicycle Route**

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NOTE: For the condition of a Shared-Use path terminating at a roadway, due to the numerous potential combinations of operating speeds, connectivity, ADA compliance, and geometry, DeIDOT Traffic shall be contacted for further guidance

**Figure 9B-6. Example of Signing for an On-Roadway Bicycle Route**

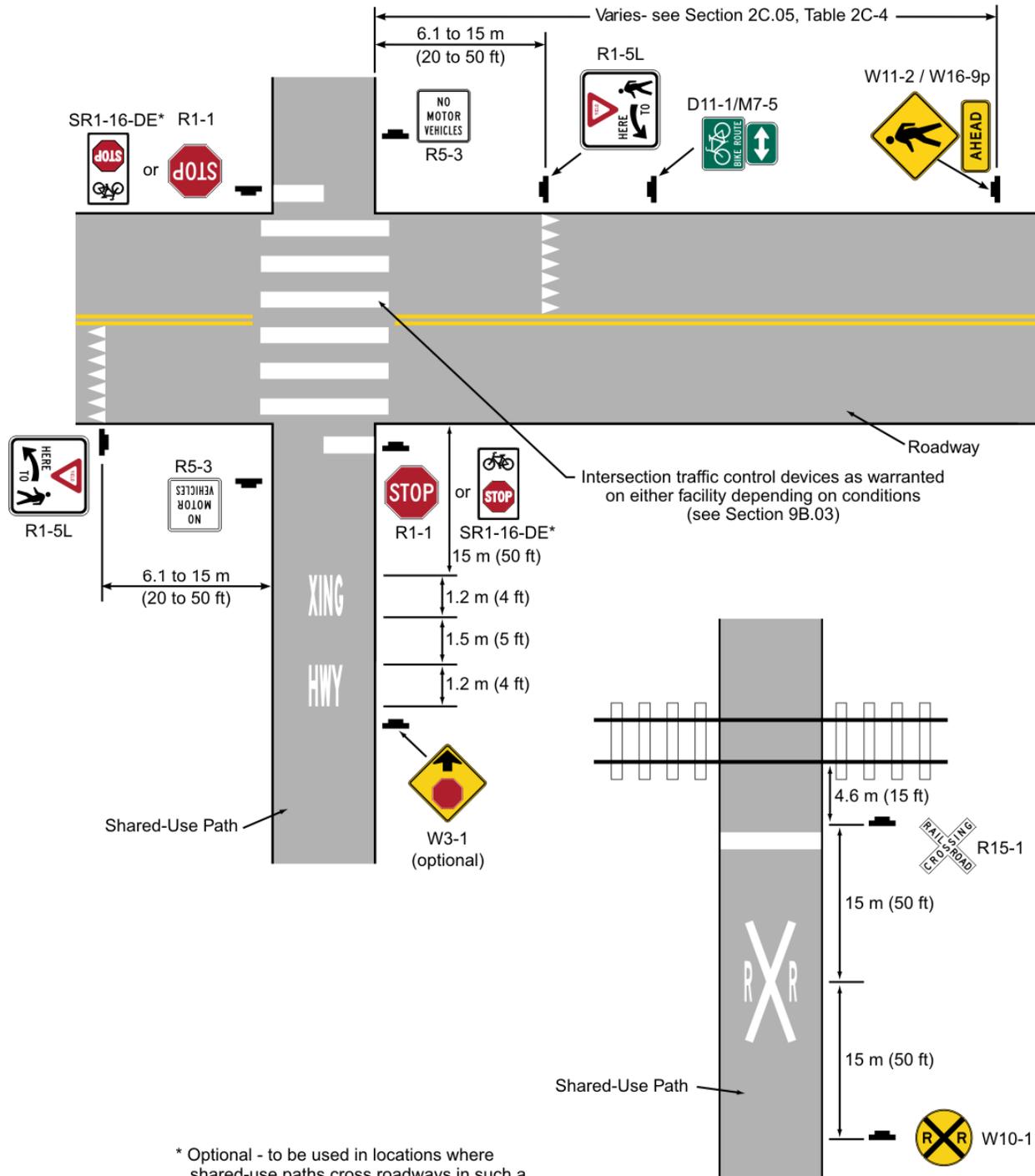


D11-1

D1-1

**Figure 9B-7.**  
**Examples of Signing and Markings for**  
**Designated Shared-Use Paths at Mid-Block Crossing**

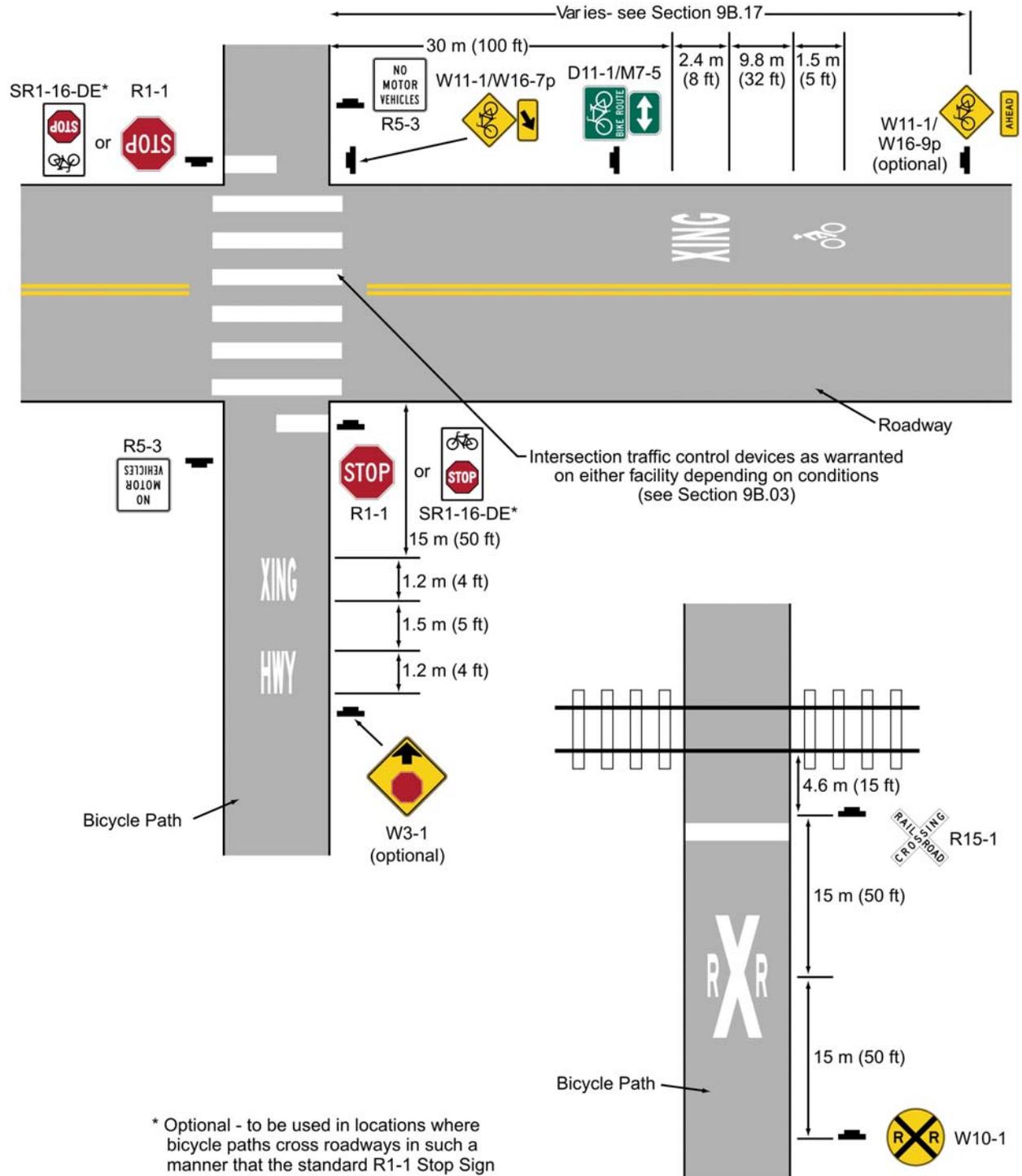
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\* Optional - to be used in locations where shared-use paths cross roadways in such a manner that the standard R1-1 Stop Sign for the shared-use path may be visible to roadway users who are not required to stop

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**Figure 9B-7a.**  
**Examples of Signing and Markings for Designated Bicycle Paths at Mid-Block Crossings**  
*(DelDOT MUTCD Only)*



\* Optional - to be used in locations where bicycle paths cross roadways in such a manner that the standard R1-1 Stop Sign for the bicycle path may be visible to roadway users who are not required to stop

**Option:**

Bicycle Route or Interstate Bicycle Route signs may be installed on shared roadways or on shared-use paths to provide guidance for bicyclists.

The Bicycle Route Guide (D11-1) sign (see Figure 9B-4) may be installed where no unique designation of routes is desired.

**Section 9B.21 Destination Arrow and Supplemental Plaque Signs for Bicycle Route Signs****Option:**

Destination (D1-1b and D1-1c) signs (see Figure 9B-4) may be mounted below Bicycle Route Guide signs, Bicycle Route signs, or Interstate Bicycle Route signs to furnish additional information, such as directional changes in the route, or intermittent distance and destination information.

The M4-11 through M4-13 supplemental plaques (see Figure 9B-4) may be mounted above the appropriate Bicycle Route Guide signs, Bicycle Route signs, or Interstate Bicycle Route signs.

**Guidance:**

If used, the appropriate arrow (M7-1 through M7-7) sign (see Figure 9B-4) should be placed below the Bicycle Route Guide sign, Bicycle Route sign, or Interstate Bicycle Route sign.

**Standard:**

**The arrow signs and supplemental plaques used with the D11-1 or M1-8 signs shall have a white legend and border on a green background.**

**The arrow signs and supplemental plaques used with the M1-9 sign shall have a white legend and border on a black background.**

**Section 9B.22 Bicycle Parking Area Sign (D4-3)****Option:**

The Bicycle Parking Area (D4-3) sign (see Figure 9B-4) may be installed where it is desirable to show the direction to a designated bicycle parking area. The arrow may be reversed as appropriate.

**Standard:**

**The legend and border of the Bicycle Parking Area sign shall be green on a retroreflectorized white background.**

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## CHAPTER 9C. MARKINGS

### Section 9C.01 Functions of Markings

Support:

Markings indicate the separation of the lanes for road users, assist the bicyclist by indicating assigned travel paths, indicate correct position for traffic control signal actuation, and provide advance information for turning and crossing maneuvers.

### Section 9C.02 General Principles

Guidance:

Bikeway design guides should be used when designing markings for bicycle facilities (see Section 9A.05).

**Standard:**

**Markings used on bikeways shall be retroreflectorized.**

Guidance:

Pavement marking symbols and/or word messages should be used in bikeways where appropriate. Consideration should be given to selecting pavement marking materials that will minimize loss of traction for bicycles under wet conditions.

**Standard:**

**The colors, width of lines, patterns of lines, and symbols used for marking bicycle facilities shall be as defined in Sections 3A.04, 3A.05, and 3B.22.**

Support:

Figures 9B-7 and 9C-1 through 9C-8 show examples of the application of lines, word messages, and symbols on designated bikeways.

Option:

A dotted line may be used to define a specific path for a bicyclist crossing an intersection (see Figure 9C-1) as described in Sections 3A.05 and 3B.08.

### Section 9C.03 Marking Patterns and Colors on Shared-Use Paths

Option:

Where shared-use paths are of sufficient width to designate two minimum width lanes, a solid yellow line may be used to separate the two directions of travel where passing is not permitted, and a broken yellow line may be used where passing is permitted (see Figure 9C-2).

Guidance:

Broken lines used on shared-use paths should have the usual 1-to-3 segment-to-gap ratio. A nominal 3 ft segment with a 9 ft gap should be used.

If conditions make it desirable to separate two directions of travel on shared-use paths at particular locations, a solid yellow line should be used to indicate no passing and no traveling to the left of the line.

Markings as shown in Figure 9C-2 should be used at the location of obstructions in the center of the path, including vertical elements intended to physically prevent unauthorized motor vehicles from entering the path.

Option:

A solid white line may be used on shared-use paths to separate different types of users. The R9-7 sign (see Figure 9B-2) may be used to supplement the solid white line.

Smaller size letters and symbols may be used on shared-use paths. Where arrows are needed on shared-use paths, half-size layouts of the arrows may be used (see Section 3B.19).

Fixed objects adjacent to shared-use paths may be marked with object markers (Type 1, 2, or 3).



Type 1



Type 2

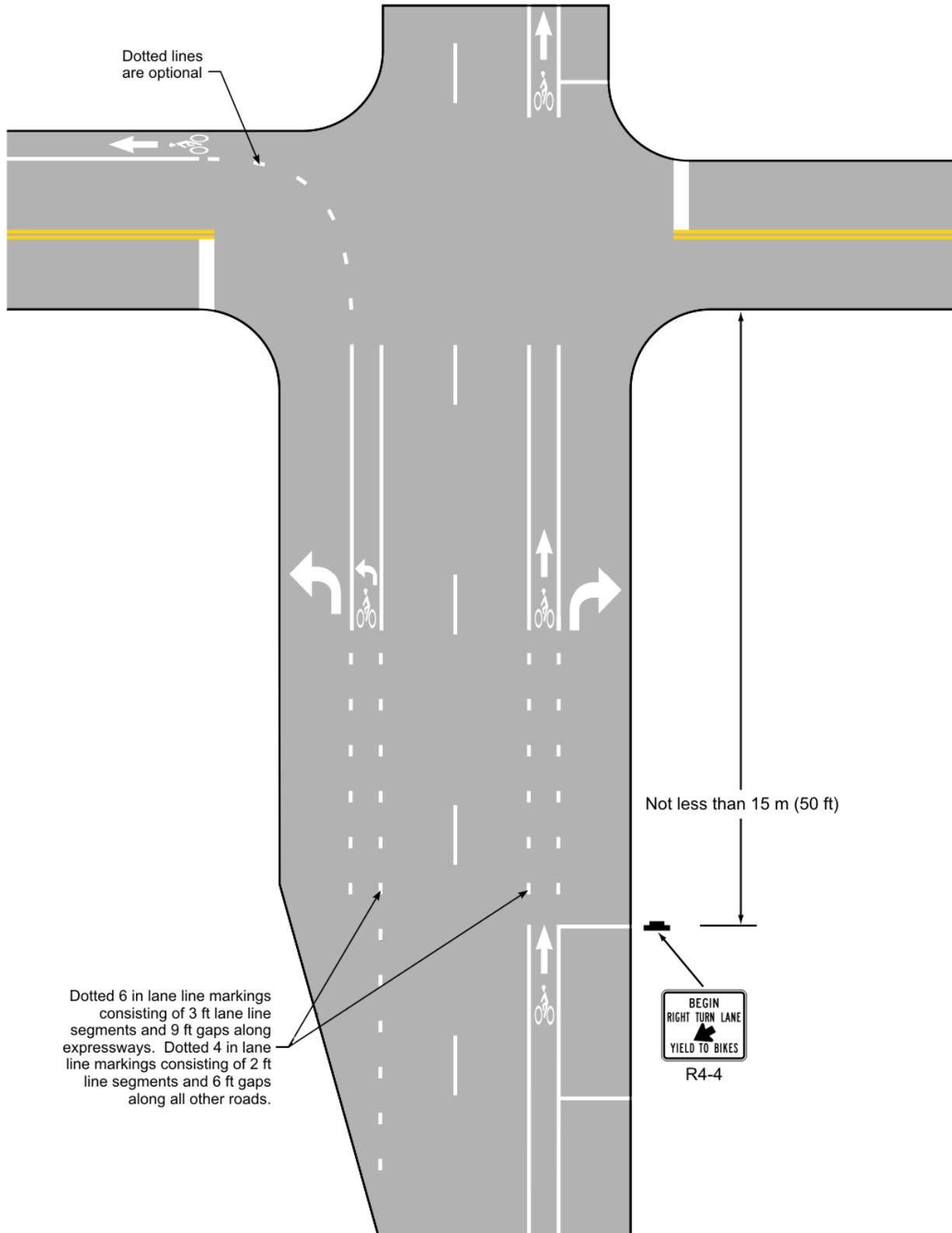


Type 3

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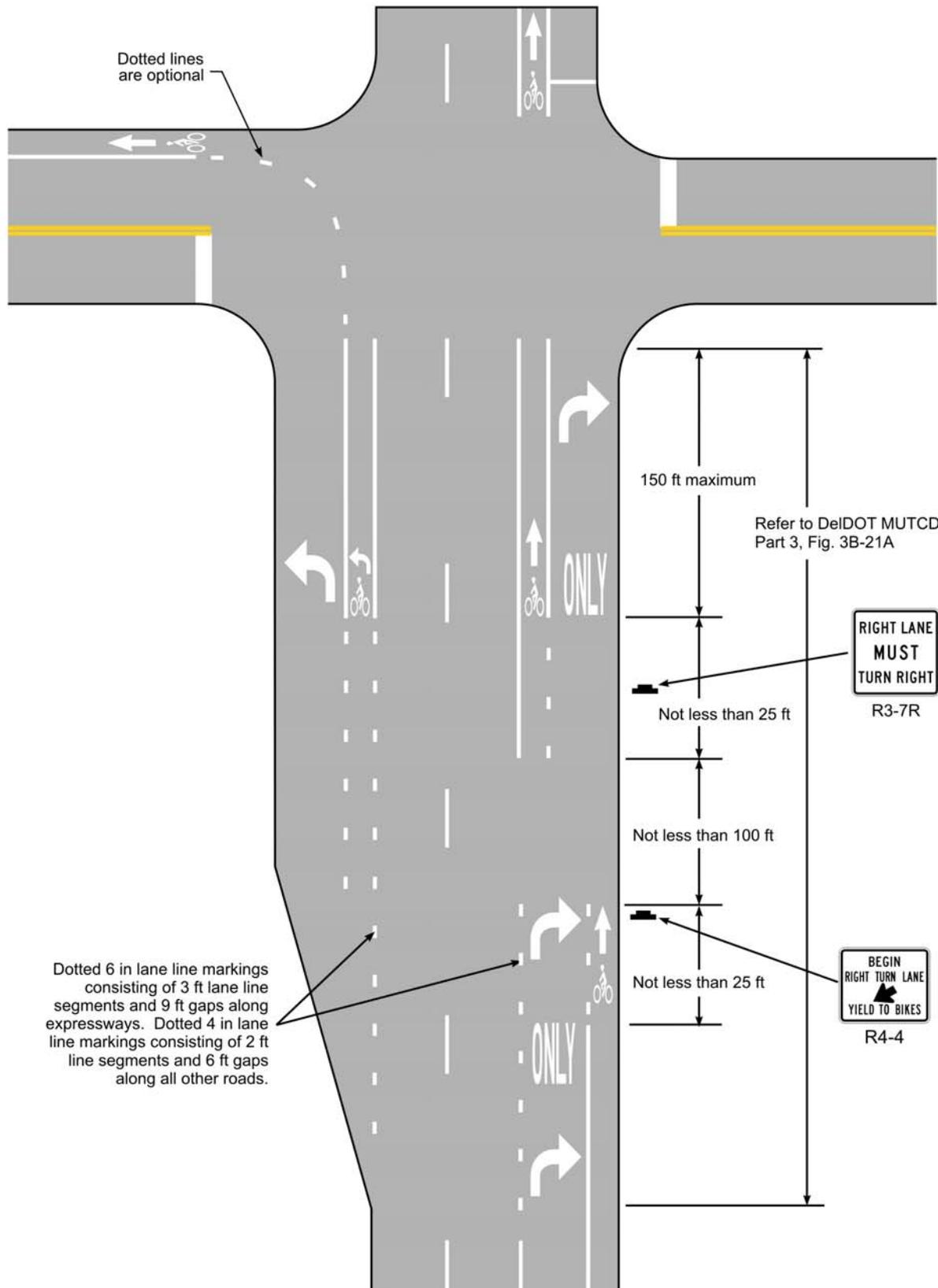
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**Figure 9C-1. Example of Intersection Pavement Markings - Designated Bicycle Lane with Left-Turn Area, Heavy Turn Volumes, Parking, One-Way Traffic, or Divided Highway**



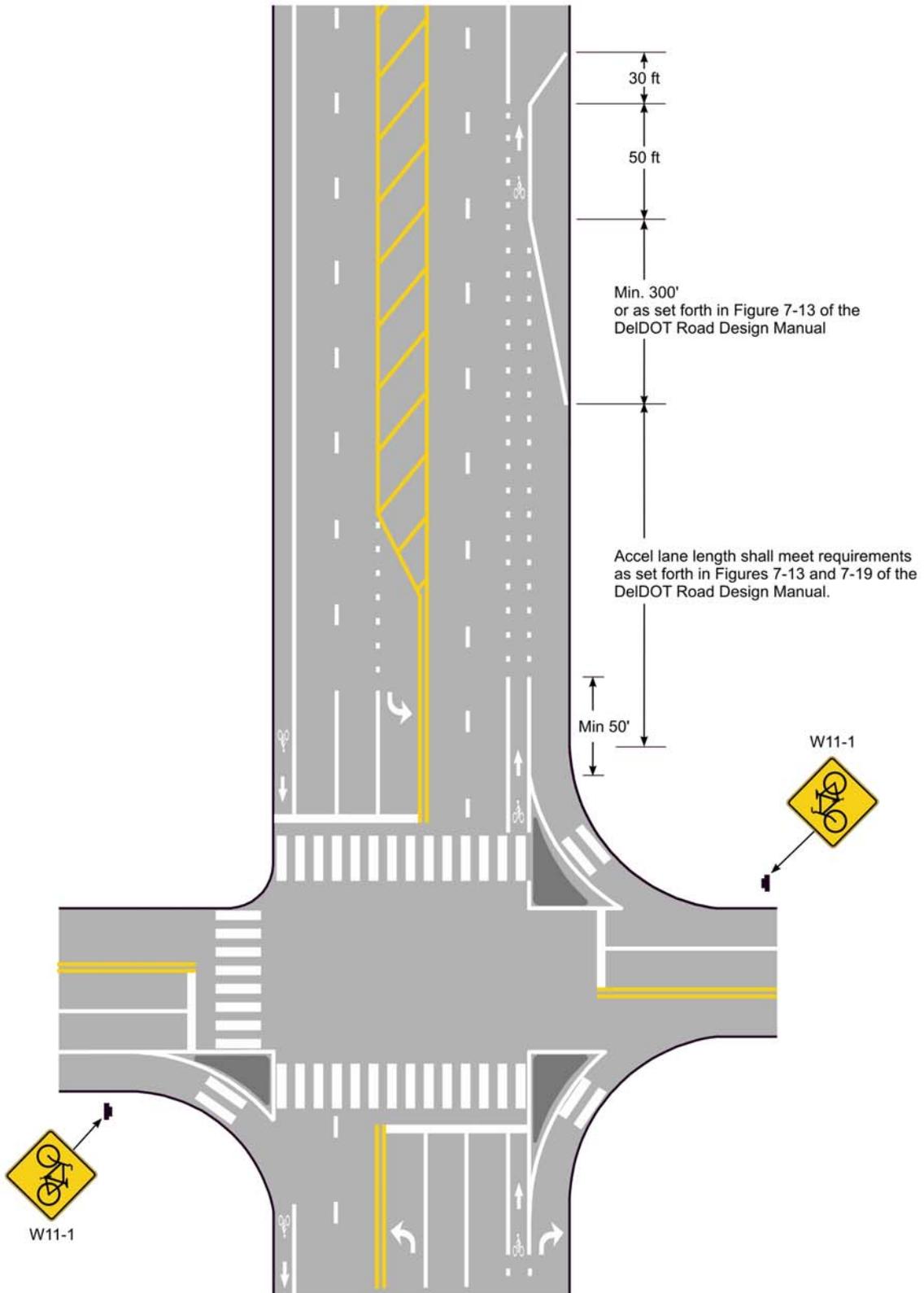
**Figure 9C-1a.**  
**Example of Intersection Pavement Markings -**  
**Designated Bicycle Lane with Right-Turn Area, Lane Drop**  
**(DeIDOT MUTCD Only)**

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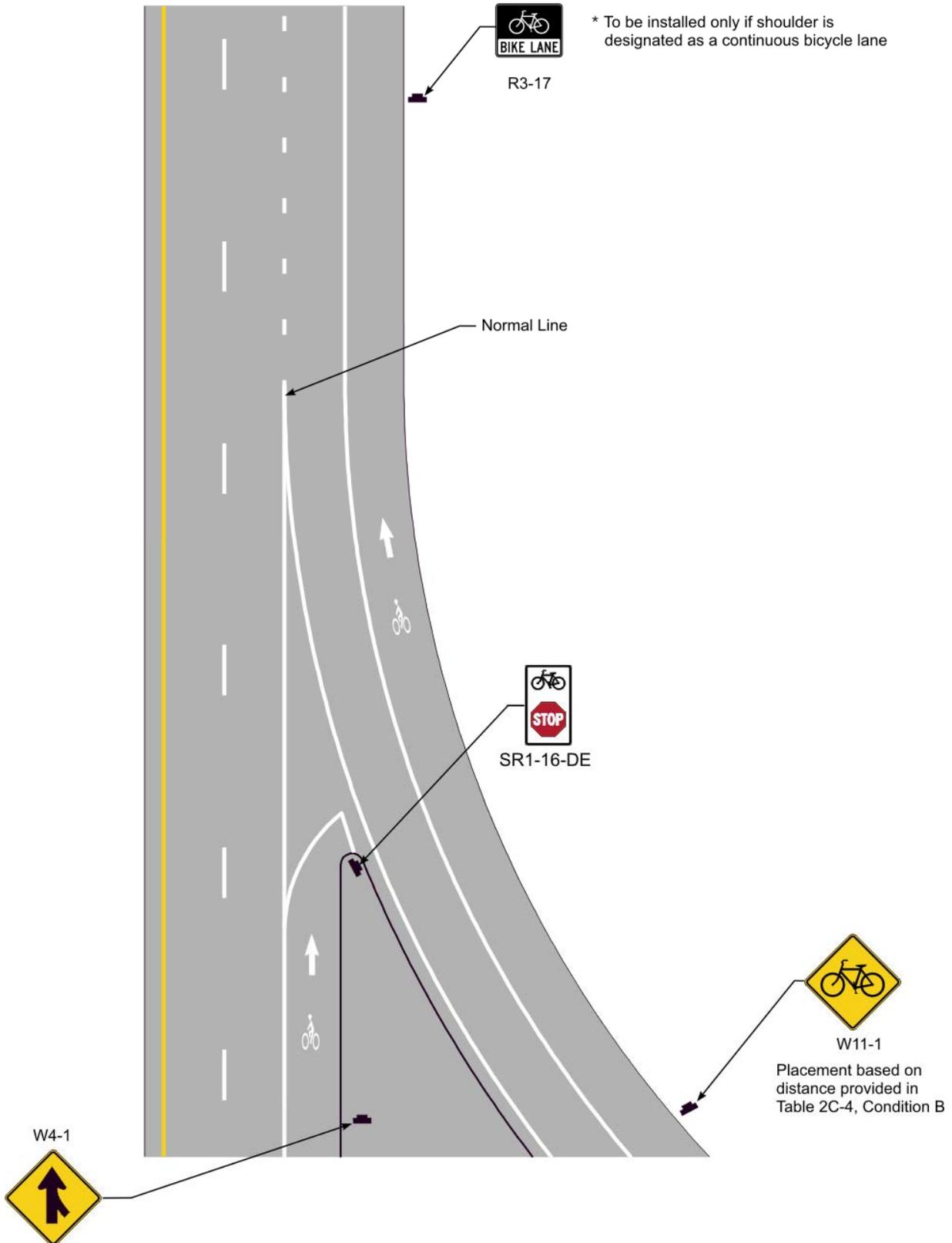
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**Figure 9C-1b**  
**Example of Intersection Pavement Markings -**  
**Designated Bicycle Lane at Intersection Departures with and without Acceleration Lanes**  
**(DelDOT MUTCD Only)**

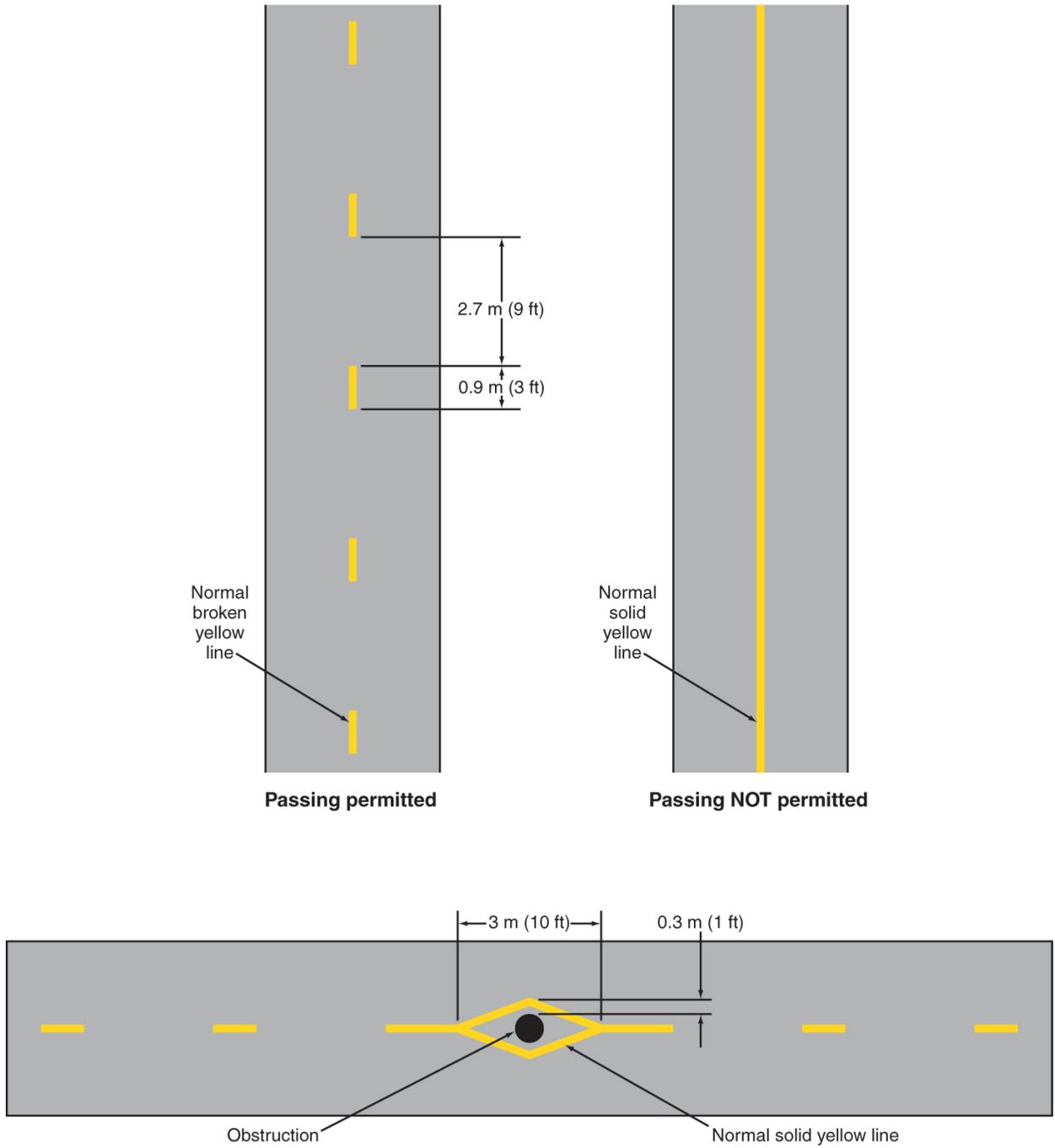


**Figure 9C-1c**  
**Example of Designated Bicycle Lane Crossing at**  
**High Speed Entrance Ramp**  
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**Figure 9C-2. Examples of Centerline Markings for Shared-Use Paths**



**Standard:**

All object markers shall be retroreflective.

Markers such as those described in Section 3C.01 shall also be used on shared-use paths, if needed.

Obstructions in the traveled way of a shared-use path shall be marked with retroreflectorized material or appropriate object markers.

On Type 3 markers, the alternating black and retroreflective yellow stripes shall be sloped down at an angle of 45 degrees toward the side on which traffic is to pass the obstruction.

**Section 9C.04 Markings For Bicycle Lanes****Guidance:**

Longitudinal pavement markings should be used to define bicycle lanes.

**Support:**

Pavement markings designate that portion of the roadway for preferential use by bicyclists. Markings inform all road users of the restricted nature of the bicycle lane.

Examples of bicycle lane markings at right-turn lanes are shown in Figures 9C-1, 9C-3, and 9C-4. Examples of pavement markings for bicycle lanes on a two-way street are shown in Figure 9C-5. Pavement symbols and markings for bicycle lanes are shown in Figure 9C-6.

**Standard:**

If used, the bicycle lane symbol marking (see Figure 9C-6) shall be placed immediately after an intersection and at other locations as needed. The bicycle lane symbol marking shall be white. If the bicycle lane symbol marking is used in conjunction with other word or symbol messages, it shall precede them.

If the word or symbol pavement markings shown in Figure 9C-6 are used, Bicycle Lane signs (see Section 9B.04) shall also be used, but the signs need not be adjacent to every symbol to avoid overuse of the signs.

A through bicycle lane shall not be positioned to the right of a right turn only lane.

**Support:**

A bicyclist continuing straight through an intersection from the right of a right turn lane would be inconsistent with normal traffic behavior and would violate the expectations of right-turning motorists.

**Guidance:**

When the right through lane drops and becomes a right turn only lane, the bicycle lane markings should stop at least 100 feet before the beginning of the right turn only lane. Through bicycle lane markings should resume to the left of the right turn only lane. Refer to Figure 9C-1a.

An optional through-right turn lane next to a right turn only lane should not be used where there is a through bicycle lane. If a capacity analysis indicates the need for an optional through-right turn lane, the bicycle lane should be discontinued at the intersection approach.

Posts or raised pavement markers should not be used to separate bicycle lanes from adjacent travel lanes.

**Support:**

Using raised devices creates a collision potential for bicyclists by placing fixed objects immediately adjacent to the travel path of the bicyclist. In addition, raised devices can prevent vehicles turning right from merging with the bicycle lane, which is the preferred method for making the right turn. Raised devices used to define a bicycle lane can also cause problems in cleaning and maintaining the bicycle lane.

**Standard:**

Bicycle lanes shall not be provided on the circular roadway of a roundabout intersection.

**Section 9C.05 Bicycle Detector Symbol****Option:**

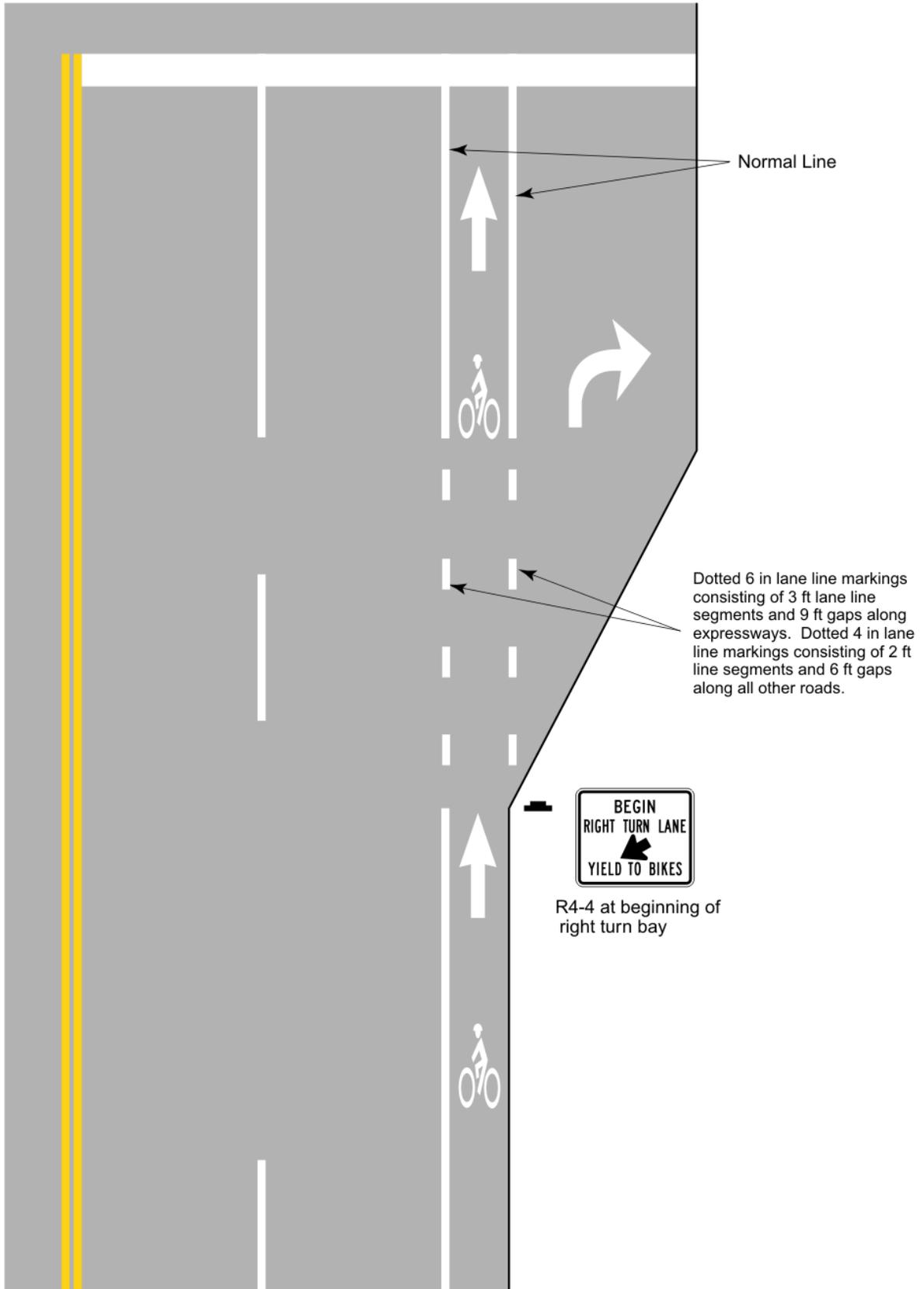
A symbol (see Figure 9C-7) may be placed on the pavement indicating the optimum position for a bicyclist to actuate the signal.

An R10-22 sign (see Section 9B.12 and Figure 9B-2) may be installed to supplement the pavement marking.

**Section 9C.06 Pavement Markings for Obstructions****Guidance:**

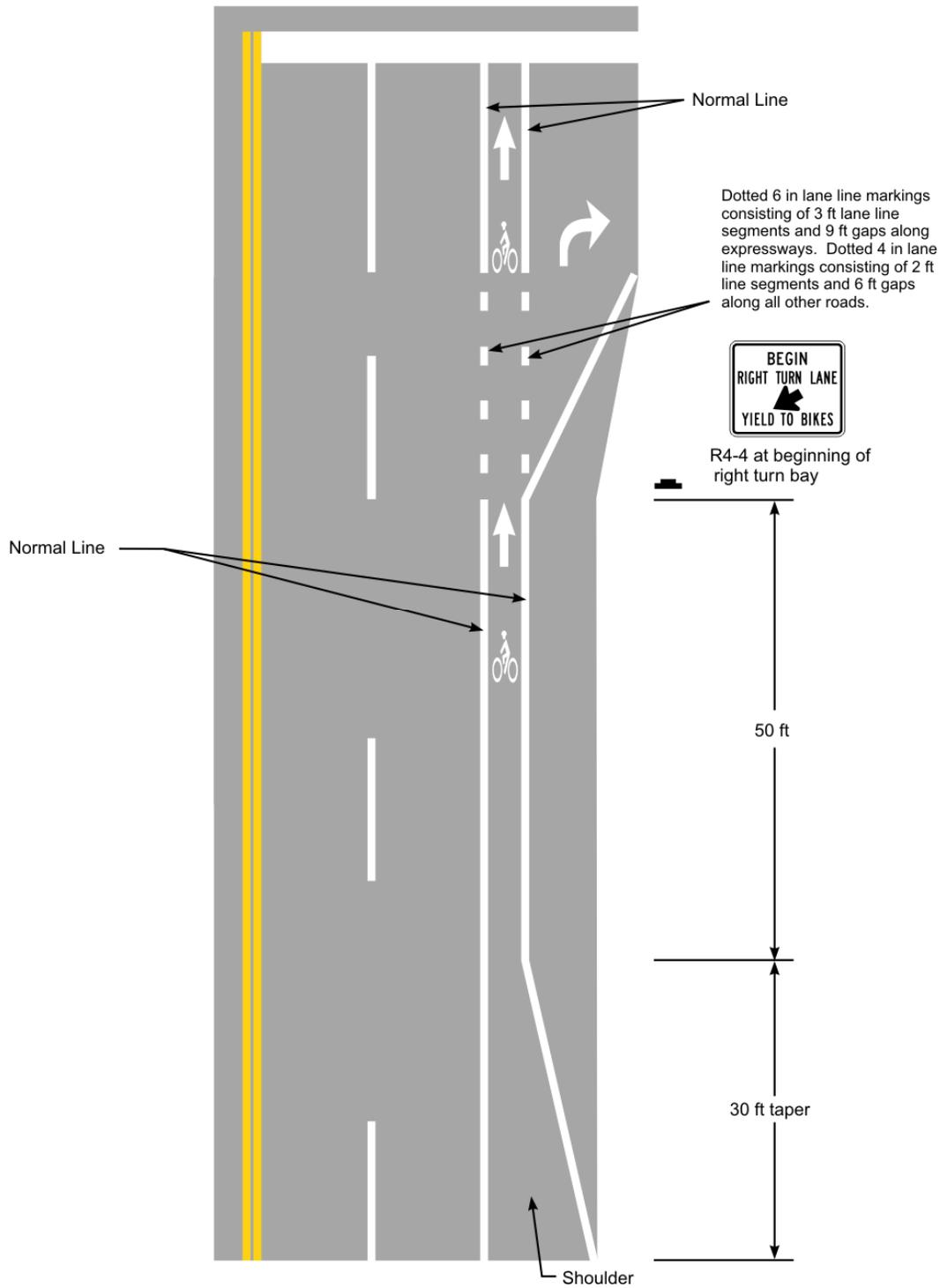
In roadway situations where it is not practical to eliminate a drain grate or other roadway obstruction that is inappropriate for bicycle travel, white markings applied as shown in Figure 9C-8 should be used.

**Figure 9C-3. Example of Bicycle Lane Treatment at a Right Turn Only Lane**

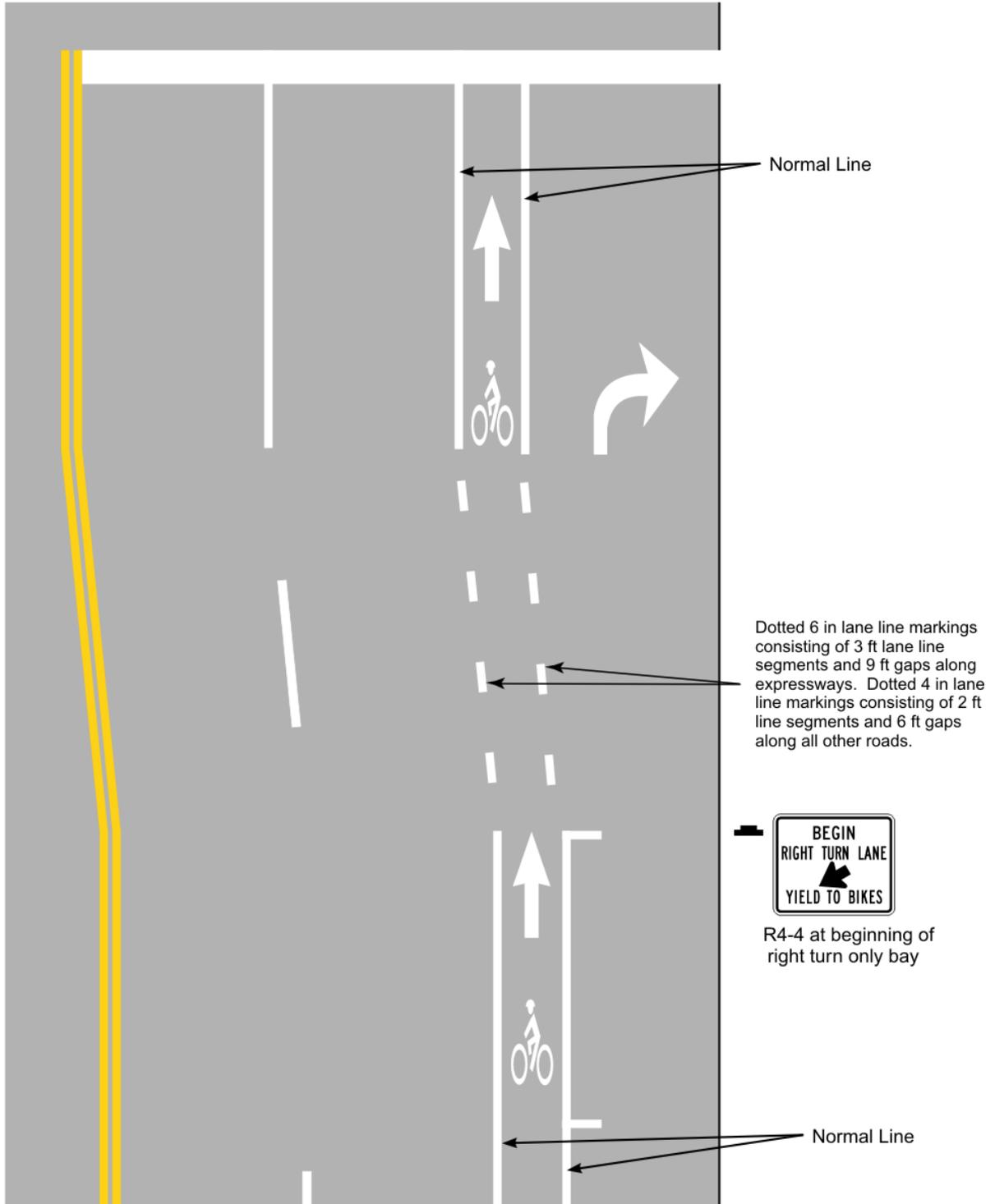


**Figure 9C-3a. Example of Bicycle Lane Treatment at a Right Turn Only Lane with Shoulder**  
*(DeIDOT MUTCD Only)*

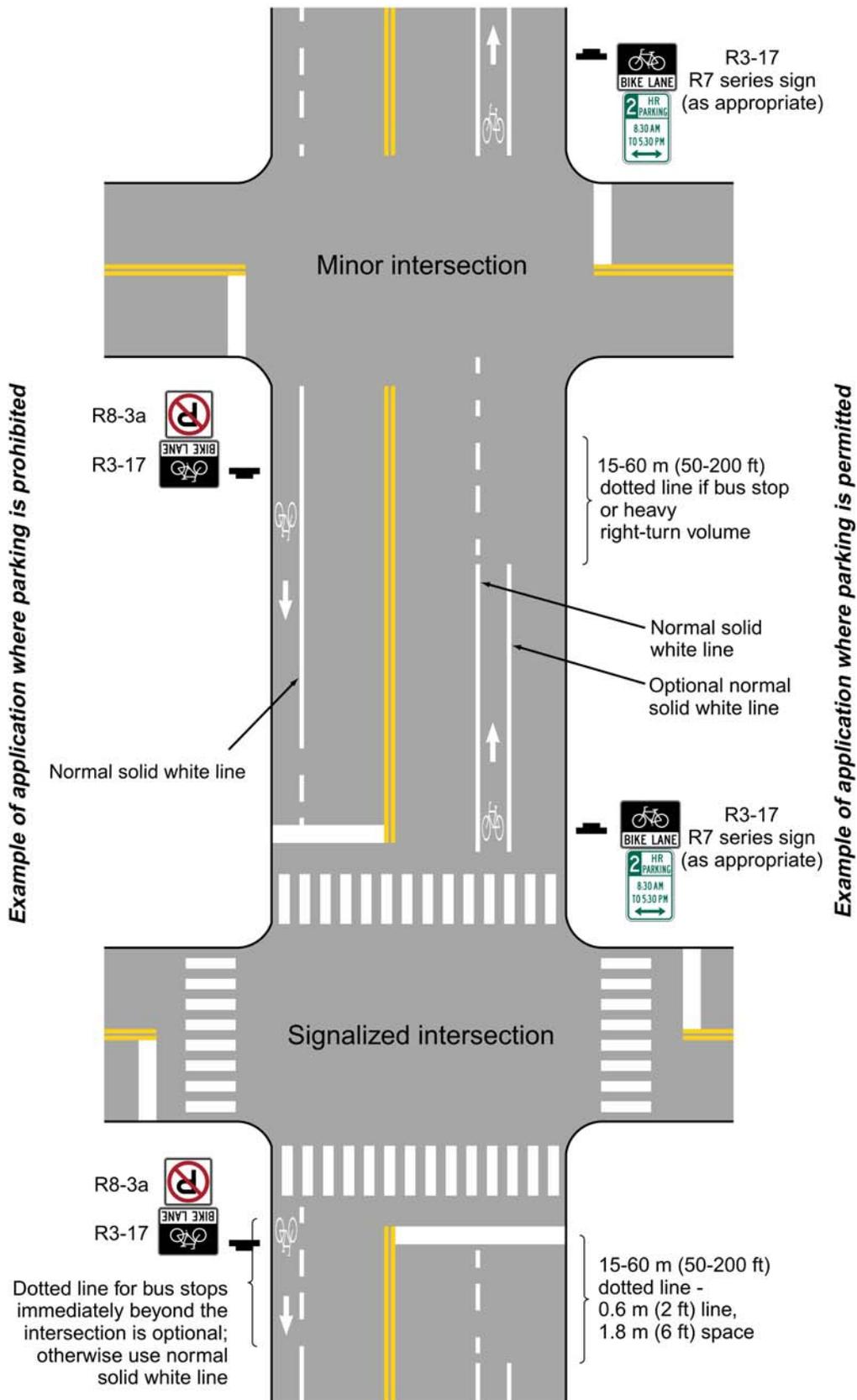
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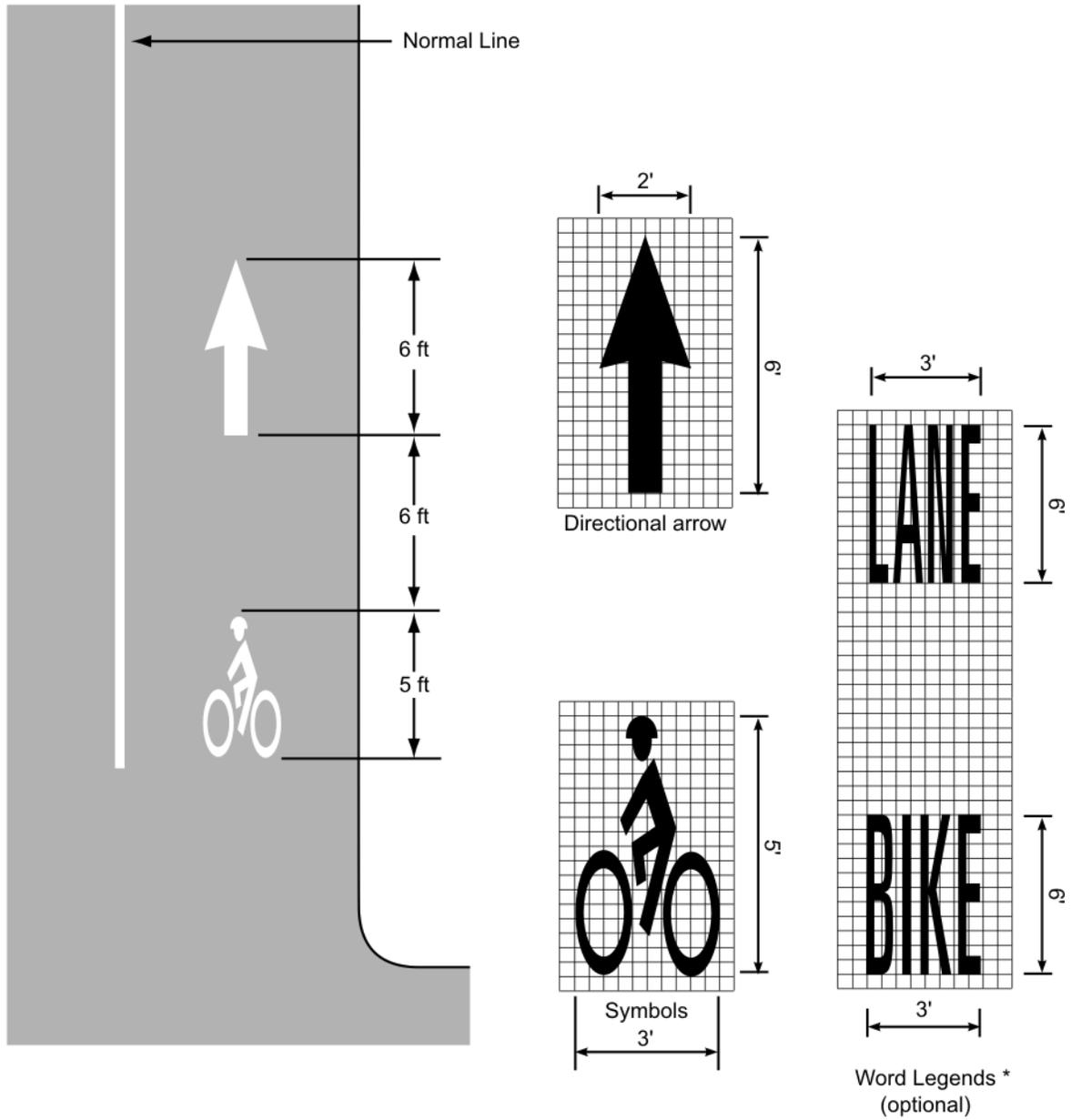
**Figure 9C-4. Example of Bicycle Lane Treatment at Parking Lane into a Right Turn Only Lane**



**Figure 9C-5. Example of Pavement Markings for Bicycle Lanes on a Two-Way Street**

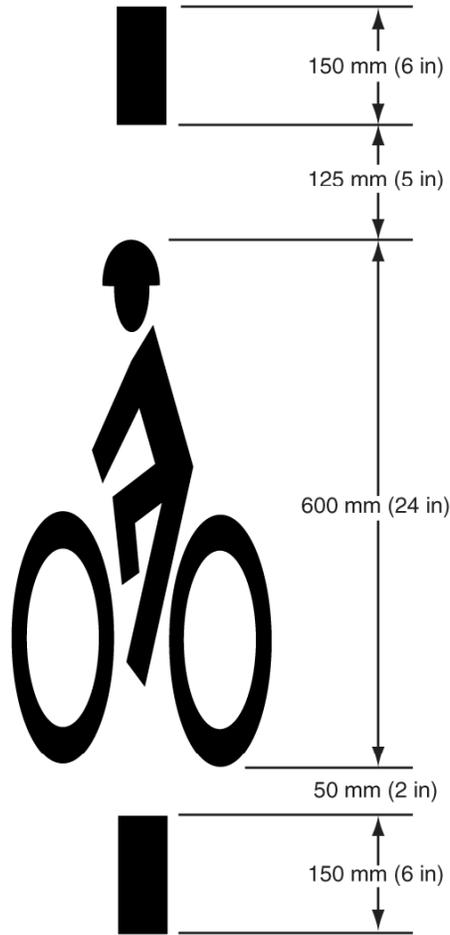


**Figure 9C-6. Example of Optional Word and Symbol Pavement Markings for Bicycle Lanes**

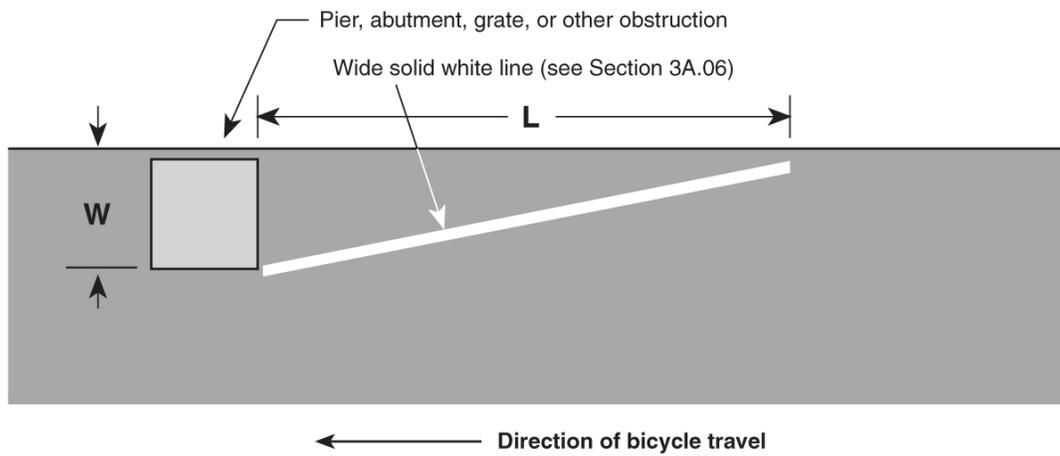


\* Note: DelDOT Traffic must approve use of this pavement marking

**Figure 9C-7. Example of Bicycle Detector Pavement Marking**



**Figure 9C-8. Example of Obstruction Pavement Marking**



**For metric units:**

$L = 0.6 WS$ , where S is bicycle approach speed in kilometers per hour

**For English units:**

$L = WS$ , where S is bicycle approach speed in miles per hour

## CHAPTER 9D. SIGNALS

### Section 9D.01 Application

Support:

Part 4 contains information regarding signal warrants and other requirements relating to signal installations.

Option:

For purposes of signal warrant evaluation, bicyclists may be counted as either vehicles or pedestrians.

### Section 9D.02 Signal Operations for Bicycles

Standard:

**At installations where visibility-limited signal faces are used, signal faces shall be adjusted so bicyclists for whom the indications are intended can see the signal indications. If the visibility-limited signal faces cannot be aimed to serve the bicyclist, then separate signal faces shall be provided for the bicyclist.**

**On bikeways, signal timing and actuation shall be reviewed and adjusted to consider the needs of bicyclists.**

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