PREFACE

Pursuant to Section 4511.09 of the Ohio Revised Code, the “Ohio Manual of Uniform Traffic Control Devices” (OMUTCD) has been established to provide a safe, uniform and efficient system of traffic control devices on all public streets, roads and highway within the State of Ohio.

The Temporary Traffic Control Manual (TTCM) is comprised of reprints of Parts 1, 5 and 6 of the complete OMUTCD. This manual has been published separately to allow for easier use by those working primarily with temporary traffic control in construction and maintenance work zones and incident management areas. OMUTCD Part 1, General Provisions, has been included in this separate publication because it provides general information for use in all areas of traffic control, including definitions of terms used. OMUTCD Part 5, Low-Volume Roads, has been included herein because it allows for some modification of the standards in OMUTCD Part 6, Temporary Traffic Control, when low-volume rural roads are involved.

Standards described within this Manual may also be used by private agencies on facilities they control. In fact, it is recommended that such be done to encourage uniformity in the meaning of traffic control devices throughout the State. Also, all holders of this manual are encouraged to have a copy of the complete OMUTCD available for reference.

This Manual is in substantial conformance with the 2003 Edition of the “Manual on Uniform Traffic Control Devices for Streets and Highways” (MUTCD) as published by the U.S. Department of Transportation, Federal Highway Administration (FHWA) and updated with Revisions 1 and 2 incorporated, dated December 2007.

Revision 2 of the 2005 OMUTCD, published in March 2011, also adopts several provisions that were published as part of the MUTCD in December 2009. For the TTCM, Revision 2 of the OMUTCD only involves pages in Part 1.

Most of the text of the OMUTCD is identical to that of the national MUTCD, while some has been modified to meet State laws or to more closely reflect conditions and policies in Ohio. References in this Manual to State Statutes should be understood to refer to the Ohio Revised Code (O.R.C.).

Text in this Manual that is different from that in the MUTCD is shown using Arial font. For example, the text on this page is in Arial font. Text based on the MUTCD (except for Figures and Tables) is shown using Times font. See the “Acknowledgements” paragraph heading on the next page for an example of Times font. When text in the OMUTCD is a quote from the O.R.C. it is shown in italic Arial font.

This manual uses a dual system of units, showing both Metric and English units. In Ohio, English units are the preferred system. Metric units are not used on traffic control signs. A reminder note has been included in the footer for each chapter. If Metric values are not available in the text, Tables A2-1 through A2-4 in Appendix A2 of Revision 2 of the 2005 OMUTCD show the equivalent Metric value that should be used.

Detail drawings for traffic control signs, along with supplemental details pertaining to standard signs and designable guide signs, can be found in the “Sign Design Manual” published by the Ohio Department of Transportation (ODOT). The pavement marking alphabet and symbols are also shown in the “Sign Design Manual.”

Contact information for ordering the OMUTCD is provided on the back of the front cover. The OMUTCD, the ODOT “Traffic Engineering Manual” (TEM), and other ODOT publications are also available from the ODOT website at www.dot.state.oh.us/drc/.

Improved designs and devices, signs for special applications and variations from standard sign designs and sizes which may be developed after the publication date of this Manual may be used in research or on an experimental basis. However, all such research and/or experimentation with new designs should be coordinated through ODOT (see Section 1A.10).
Acknowledgments

The Ohio Department of Transportation (ODOT) gratefully acknowledges the valuable assistance provided by the Federal Highway Administration (FHWA), the Ohio Section of the Institute of Transportation Engineers (Ohio ITE), the County Engineers Association of Ohio (CEAO), the Ohio Contractor’s Association (OCA) and other
Part 1

General

Reprint of Part 1 of the OMUTCD, 2005 Edition

Ohio Department of Transportation
Office of Traffic Engineering
PART 1. GENERAL

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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.

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.

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 the Ohio Revised Code (O.R.C.), or in cases not covered by State statute, by local ordinance or resolution.

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. Additional information regarding related sections of the Ohio Revised Code (O.R.C.) is provided in Appendices B1 and B2.

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:

All symbols shall be unmistakably similar to or mirror images of the symbol signs adopted by FHWA and shown in the “Standard Highway Signs” book published by FHWA (see Section 1A.11). The symbols adopted for use in Ohio are shown in the “Sign Design Manual” (SDM) published by ODOT (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 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. In the State of Ohio, these responsibilities shall be as established in Sections 4511.09, 4511.10 and 4511.11 of the Ohio Revised Code (see Appendix B2).

Support:

As provided in Section 4511.09 of the Ohio Revised Code (see Appendix B2), the “Ohio Manual of Uniform Traffic Control Devices” has been adopted by the Ohio Department of Transportation to provide for a “uniform system of traffic control devices…for use upon highways in this state.”

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.

Support:

Section 4511.16 of the Ohio Revised Code (O.R.C.) prohibits the display of any unauthorized sign, signal, marking or device which interferes with the effectiveness of any official traffic control device and permits its removal by the authority having jurisdiction over the street or highway (see Appendix B2).
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 Ohio Department of Transportation (ODOT), 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:

Except as provided in the following Option, requests for any permission to experiment or interim approval shall be submitted electronically to the Federal Highway Administration (FHWA), Office of Transportation Operations, MUTCD team, at the following e-mail address: MUTCDofficialrequest@dot.gov. A copy of the request shall be sent to the Ohio Department of Transportation (ODOT), Office of Traffic Engineering (see page ii for contact information).

Requests for interpretations or changes shall be sent to the Ohio Department of Transportation (ODOT), Office of Traffic Engineering (see page ii for contact information).

Option:

If electronic submission to FHWA is not possible, requests for permission to experiment or interim approval may instead be submitted to the Office of Transportation Operations HOTP-1, Federal Highway Administration, 1200 New Jersey Avenue, SE, Washington, DC 20590.

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

1. Requesting jurisdiction submits request to FHWA

   * With a copy to the ODOT Office of Traffic Engineering.

   FHWA Review

   Approved?

   No

   Requesting jurisdiction responds to questions raised by FHWA

   Yes

   Requesting jurisdiction installs experimental traffic control device

   Evaluate experimental traffic control device

   Requesting jurisdiction provides semi-annual reports to FHWA Division & HQ

   Requesting jurisdiction provides FHWA a copy of final report

OMUTCD - English units are preferred.
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:

Requests for changes to the Manual include 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.
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. Ordinarly 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 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:
The Ohio Department of Transportation (ODOT) may submit a request for interim approval for all jurisdictions in the 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 outlining FHWA’s process for incorporating new traffic control devices into the national MUTCD is shown in Figure 1A-2.

For additional information concerning interpretations, experimentation, changes, or interim approvals, contact the ODOT, Office of Traffic Engineering at the address provided on page ii.

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: the current “Sign Design Manual” (SDM), published by ODOT; 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 SDM includes standard alphabets and symbols for highway signs and pavement markings.

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

For information about publications published by the Ohio Department of Transportation (ODOT), visit the ODOT reference resource website at www.dot.state.oh.us/drrc, or write to the ODOT Office of Contracts, 1980 West Broad Street, P.O. Box 899, Columbus, Ohio 43216-0899.

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.


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

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

Experiment Successful (see Figure 1A-1) → Analytical or Laboratory Study Results and/or non-U.S. experimentation → Request for change from jurisdiction or interested party → FHWA Review

Jurisdiction restores experiment site to original condition → See Figure 1A-1

Further experimentation required? NO → Accepted for Federal rulemaking? NO

Interim approval? YES → FHWA notifies interested parties (if any)

FHWA notifies all States and distributes simplified application form for submission by jurisdictions

Jurisdictions apply for and receive Interim Approval → Jurisdictions deploy devices under Interim Approval conditions

Final Rule different from Interim Approval? NO

FHWA publishes Final Rule

FHWA prepares Final Rule

FHWA prepares Notice of Proposed Amendment

Docket comment period

FHWA reviews comments

No action required → FHWA publishes Final Rule

State Manuals must be in substantial conformance with the National MUTCD within 2 years as specified in 23 CFR 655.663(a)

State Manuals must be in substantial conformance with the National MUTCD within 2 years as specified in 23 CFR 655.663(a)
17. “Preemption of Traffic Signals at or Near Railroad Grade Crossings with Active Warning Devices,” (ITE)
33. “Ohio Revised Code” (O.R.C.)

OMUTCD - English units are preferred.
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 “Ohio Revised 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)—any United States or state numbered route, controlled access highway, or other major radial or circumferential street or highway designated by local authorities within their respective jurisdictions as part of a major arterial system of streets or highways. [4511.01(CCC), O.R.C.]
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—every device, other than a tricycle designed solely for use as a play vehicle by a child, propelled solely by human power upon which any person may ride having either two tandem wheels, or one wheel in the front and two wheels in the rear, any of which is more than fourteen inches in diameter. [4511.01(G), O.R.C.]

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. 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.

14. 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.

15. 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.

16. Conventional Road—a street or highway other than a low-volume road (as defined in Section 5A.01), expressway, or freeway.

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—means:
   (1) That part of a roadway at intersections ordinarily included within the real or projected prolongation of property lines and curb lines or, in the absence of curbs, the edges of the traversable roadway,
   (2) Any portion of a roadway at an intersection or elsewhere, distinctly indicated for pedestrian crossing by lines or other markings on the surface,
   (3) Notwithstanding divisions (1) and (2) of this section, there shall not be a crosswalk where local authorities have placed signs indicating no crossing. [4511.01(LL), O.R.C.]

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. Downstream—a term that refers to a location that is encountered by traffic subsequent to an upstream location as it flows in an “upstream to downstream” direction. For example, “the downstream end of a lane line separating the turn lane from a through lane on the approach to an intersection” is the end of the lane line that is closest to the intersection.

23. Driver (or Operator)—every person who drives or is in actual physical control of a vehicle, trackless trolley, or streetcar. [4511.01 (Y), O.R.C.]

24. Dynamic Envelope—the clearance required for the train and its cargo overhang due to any combination of loading, lateral motion, or suspension failure.

25. Edge Line Markings—white or yellow pavement marking lines that delineate the right or left edge(s) of a traveled way.

26. 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.

27. 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.

28. 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.

29. Expressway—a divided arterial highway for through traffic with full or partial control of access with an excess of fifty percent of all crossroads separated in grade. [4511.01(ZZ), O.R.C.]

30. Flashing—an operation in which a signal indication is turned on and off repetitively.

31. Freeway—a divided multi-lane highway for through traffic with all crossroads separated in grade and with full control of access. [4511.01(YY), O.R.C.]

32. Guide Sign—a sign that shows route designations, destinations, directions, distances, services, points of interest, or other geographical, recreational, or cultural information.

33. High Occupancy Vehicle (HOV)—a motor vehicle carrying at least two or more persons, including carpools, vanpools, and buses.

34. Highway (or Street)—the entire width between the boundary lines of every way open to the use of the public as a thoroughfare for purposes of vehicular travel. [4511.01(BB), O.R.C.]

35. Highway, Controlled-Access—Every street or highway in respect to which owners or occupants of abutting lands and other persons have no legal right of access to or from the same except at such points only and in such manner as may be determined by the public authority having jurisdiction over such street or highway. [4511.01 (CC), O.R.C.]

36. Highway, Through—Every street or highway as provided in section 4511.65 of the Revised Code. [4511.01(HH), O.R.C.]

37. 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.

38. 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.

39. 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.

40. Hybrid Beacon—a special type of beacon that is intentionally placed in a dark mode (no indications displayed) between periods of operation and, when operated, displays both steady and flashing traffic control signal indications.

41. 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.

42. Interchange—a system of interconnecting roadways providing for traffic movement between two or more highways that do not intersect at grade.

43. Intermediate Interchange—an interchange with an urban or rural route that is not a major or minor interchange as defined herein.

44. Intersection—means:
   (1) The area embraced within the prolongation or connection of the lateral curb lines, or, if none, then the lateral boundary lines of the roadways of two highways which join one another at, or approximately at, right angles, or the area within which vehicles traveling upon different highways joining at any other angle may come in conflict.
   (2) Where a highway includes two roadways thirty feet or more apart, then every crossing of each roadway of such divided highway by an intersecting highway shall be regarded as a separate intersection. If an intersecting highway also includes two roadways thirty feet or more apart, then every crossing of two roadways of such highways shall be regarded as a separate intersection.
   (3) The junction of an alley with a street or highway, or with another alley, shall not constitute an intersection. [4511.01(KK), O.R.C.]

45. 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.

46. Lane Line Markings—white pavement marking lines that delineate the separation of traffic lanes that have the same direction of travel on a roadway.

47. 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.

48. Legend—see Sign Legend.

49. Logo—a distinctive emblem, symbol, or trademark that identifies a product or service.

50. 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.

51. Major Conventional Road—a divided or undivided highway with four or more lanes where the primary access is by grade-separated interchanges and at-grade intersections with public roads, with numerous secondary access points with commercial and/or private driveways. Major conventional roads may or may not have partial control of access.

52. 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.

53. Major Street—the street normally carrying the higher volume of vehicular traffic.

54. 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.

55. 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.

56. Minor Street—the street normally carrying the lower volume of vehicular traffic.
57. Object Marker—a device used to mark obstructions within or adjacent to the roadway.
58. 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.
59. Occupant—a person driving or riding in a car, truck, bus, or other vehicle.
60. 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.
61. Pedestrian—*any natural person afoot.* [4511.01(X), O.R.C.]
62. Pedestrian Facilities—a general term denoting improvements and provisions made to accommodate or encourage walking.
63. Pedestrian Hybrid Beacon—a special type of hybrid beacon used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.
64. 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.
65. Principal Legend—place names, street names, and route numbers placed on guide signs.
66. Public Road—any road or street under the jurisdiction of and maintained by a public agency and open to public travel.
67. Railroad—a *carrier of persons or property operating upon rails placed principally on a private right-of-way.* [4511.01(P), O.R.C.]
68. 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.
69. Regulatory Sign—a sign that gives notice to road users of traffic laws or regulations.
70. 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.
71. Right-of-Way—*means either of the following, as the context requires:*
   
   (1) *The right of a vehicle, streetcar, trackless trolley, or pedestrian to proceed uninterruptedly in a lawful manner in the direction in which it or the individual is moving in preference to another vehicle, streetcar, trackless trolley, or pedestrian approaching from a different direction into its or the individual's path;*
   
   (2) *A general term denoting land, property, or the interest therein, usually in the configuration of a, strip, acquired for or devoted to transportation purposes. When used in this context, right-of-way includes the roadway, shoulders or berm, ditch, and slopes extending to the right-of-way limits under the control of the state or local authority.* [4511.01 (UU), O.R.C.]
72. Road—see Roadway.
73. Roadway—that portion of a highway improved, designed, or ordinarily used for vehicular travel, except the berm or shoulder. If a highway includes two or more separate roadways the term "roadway" means any such roadway separately but not all such roadways collectively. [4511.01(EE), O.R.C.]
74. Roadway Network—a geographical arrangement of intersecting roadways.
75. Road User—a vehicle operator, bicyclist, or pedestrian within the highway, including persons with disabilities.
76. 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).
77. 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.
78. Rural Highway—a type of roadway normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians.
79. **Safety Zone**—the area or space officially set apart within a roadway for the exclusive use of pedestrians and protected or marked or indicated by adequate signs as to be plainly visible at all times. [4511.01(MM), O.R.C.]

80. **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.

81. **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.

82. **Sidewalk**—that portion of a street between the curb lines, or the lateral lines of a roadway, and the adjacent property lines, intended for the use of pedestrians. [4511.01(FF), O.R.C.]

83. **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.

84. **Sign Assembly**—a group of signs, located on the same support(s), that supplement one another in conveying information to road users.

85. **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.

86. **Sign Legend**—all word messages, logos, and symbol designs that are intended to convey specific meanings.

87. **Sign Panel**—a separate panel or piece of material containing a word or symbol legend that is affixed to the face of a sign.

88. **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.

89. **Speed Limit**—the maximum (or minimum) speed applicable to a section of highway as established by law.

90. **Speed Measurement Marking**—a white transverse pavement marking placed on the roadway to assist the enforcement of speed regulations.

91. **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.

92. **State Highway**—a highway under the jurisdiction of the department of transportation, outside the limits of municipal corporations, provided that the authority conferred upon the director of transportation in section 5511.01 of the Revised Code to erect state highway route markers and signs directing traffic shall not be modified by sections 4511.01 to 4511.79, and 4511.99 of the Revised Code. [4511.01(II), O.R.C.]
93. State Route—Every highway which is designated with an official state route number and so marked. [4511.01(JJ), O.R.C.]

94. 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.

95. Street—see Highway.

96. 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.

97. Traffic—pedestrians, ridden or herded animals, vehicles, streetcars, trackless trolleys, and other devices, either singly or together, while using any highway for purposes of travel. [4511.01(TT), O.R.C.]

98. Traffic Control Devices—all flaggers signs, signals, markings, and devices placed or erected by authority of a public body or official having jurisdiction, for the purpose of regulating, warning, or guiding traffic, including signs denoting names of streets and highways. [4511.01(QQ), O.R.C.]

99. Traffic Control Signal (Traffic Signal)—any device, whether manually, electrically, or mechanically operated, by which traffic is alternately directed to stop, to proceed, to change direction, or not to change direction. [4511.01(RR), O.R.C.]

100. 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.

101. 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.

102. Traveled Way—the portion of the roadway for the movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.

103. 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.

104. Upstream—a term that refers to a location that is encountered by traffic prior to a downstream location as it flows in an “upstream to downstream” direction. For example, “the upstream end of a lane line separating the turn lane from a through lane on the approach to an intersection” is the end of the line that is furthest from the intersection.

105. Vehicle—every device, including a motorized bicycle, in, upon, or by which any person or property may be transported or drawn upon a highway, except that “vehicle” does not include any motorized wheelchair, any electric personal assistive mobility device, any device that is moved by power collected from overhead electric trolley wires or that is used exclusively upon stationary rails or tracks, or any device, other than a bicycle, that is moved by human power. [4511.01(A), O.R.C.]

106. Vehicle, Emergency—emergency vehicles of municipal, township, or county departments or public utility corporations when identified as such as required by law, the director of public safety, or local authorities, and motor vehicles when commandeered by a police officer. [4511.01(D), O.R.C.]

107. Vehicle, Motor—every vehicle propelled or drawn by power other than muscular power or power collected from overhead electric trolley wires, except motorized bicycles, road rollers, traction engines, power shovels, power cranes, and other equipment used in construction work and not designed for or employed in general highway transportation, hole-digging machinery, well-digging machinery, farm machinery, trailers used to transport agricultural produce or agricultural production materials between a local place of storage or supply and the farm when drawn or towed on a street or highway at a speed of twenty-five miles per hour or less, threshing machinery, hay-baling machinery, agricultural tractors and machinery used in the production of horticultural, floricultural, agricultural and vegetable products, and trailers designed and used exclusively to transport a boat between a place of storage and a marina, or in and around a marina, when drawn or towed on a street or
highway for a distance of no more than ten miles and at a top speed of twenty-five miles per hour or less. [4511.01(B), O.R.C.]

108. Vehicle, Public Safety—means any of the, following:

(1) Ambulances, including private ambulance companies under contract to a municipal corporation, township, or county, and private ambulances and nontransport vehicles bearing license plates issued under section 4503.49 of the Revised Code,

(2) Motor vehicles used by public law enforcement officers or other persons sworn to enforce the criminal and traffic laws of the state;

(3) Any motor vehicle when properly identified as required by the director of public safety, when used in response to fire emergency calls or to provide emergency medical service to ill or injured persons, and when operated by a duly qualified person who is a member of a volunteer rescue service or a volunteer fire department, and who is on duty pursuant to the rules or directives of that service. The state fire marshal shall be designated by the director of public safety as the certifying agency for all public safety vehicles described in division (E)(3) of this section.

(4) Vehicles used by fire departments, including motor vehicles when used by volunteer fire fighters responding to emergency calls in the fire department service when identified as required by the director of public safety. Any vehicles used to transport or provide emergency medical service to an ill or injured person, when certified as a public safety vehicle, shall be considered a public safety vehicle when transporting an ill or injured person to a hospital regardless of whether such vehicle has already passed a hospital.

(5) Vehicles used by the commercial motor vehicle safety enforcement unit for the enforcement orders and rules of the public utilities commission as specified in section 5503.34 of the Revised Code. [4511.01(E), O.R.C.]

109. Warning Sign—a sign that gives notice to road users of a situation that might not be readily apparent.

110. 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.

111. 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

<table>
<thead>
<tr>
<th>Word Message</th>
<th>Standard Abbreviation</th>
</tr>
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<tbody>
<tr>
<td>Afternoon / Evening PM</td>
<td>PM</td>
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<tr>
<td>Alternate</td>
<td>ALT</td>
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<tr>
<td>Avenue</td>
<td>AVE, AV</td>
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<td>Bicycle</td>
<td>BIKE</td>
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<td>Boulevard</td>
<td>BLVD</td>
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<tr>
<td>Cannot</td>
<td>CANT</td>
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<td>CB Radio</td>
<td>CB</td>
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<tr>
<td>Center</td>
<td>CNTR</td>
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<tr>
<td>Circle</td>
<td>CIR</td>
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<td>Civil Defense</td>
<td>CD</td>
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<td>Compressed Natural Gas</td>
<td>CNG</td>
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<td>Court</td>
<td>CT</td>
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<tr>
<td>Crossing (other than highway-rail)</td>
<td>XING</td>
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<td>Diesel Fuel</td>
<td>D</td>
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<tr>
<td>Do Not</td>
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<td>Drive</td>
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<td>East</td>
<td>E</td>
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<td>Eastbound</td>
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<td>Electric Vehicle</td>
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<td>Emergency</td>
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<td>Entrance, Enter</td>
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<td>Hazardous Material</td>
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<td>High Occupancy Vehicle</td>
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<td>Highway</td>
<td>HWY</td>
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<td>Highway-Rail Grade Crossing Pavement Marking</td>
<td>RXR</td>
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<td>Hospital</td>
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<td>Hour(s)</td>
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<td>Information</td>
<td>INFO</td>
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<td>Inherently Low Emission Vehicle</td>
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<td>It Is</td>
<td>ITS</td>
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<td>Junction / Intersection</td>
<td>JCT</td>
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<tr>
<td>Kilogram</td>
<td>kg</td>
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<tr>
<td>Kilometer(s)</td>
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<td>Kilometers per hour</td>
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<td>Lane</td>
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<tr>
<td>Left</td>
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<td>Liquid Propane Gas</td>
<td>LP-GAS</td>
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<table>
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<tr>
<th>Word Message</th>
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<td>Metric Ton</td>
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<td>SHLDR</td>
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<td>Southbound</td>
<td>S-BND</td>
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<td>Ties With Lugs</td>
<td>LUGS</td>
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<td>Tones of Weight</td>
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<td>Traffic</td>
<td>TRAF</td>
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<td>Trail</td>
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Table 1A-2. Abbreviations That Are Acceptable Only with a Prompt Word

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<td>BLKD</td>
<td>Lane*</td>
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<td>CONG</td>
<td>Traffic*</td>
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<td>Downtown</td>
<td>DWNTN</td>
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<td>Next*</td>
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<td>PVMT</td>
<td>Wet*</td>
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<td>Quality</td>
<td>QLTY</td>
<td>Air*</td>
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<td>RDWK</td>
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<tr>
<td>Route</td>
<td>RT, RTE</td>
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<td>TWNNSHP</td>
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<td>Upper</td>
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* These prompt words should precede the abbreviation.
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<td>Feeder</td>
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</tr>
<tr>
<td>L</td>
<td>Left</td>
<td>Lane</td>
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<td>LT</td>
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<td>Red</td>
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<td>Standard</td>
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<td>Warning</td>
<td>Wrong</td>
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Part 5

Low-Volume Rural Roads

Reprint of Part 5 of the OMUTCD, 2005 Edition

Ohio Department of Transportation
Office of Traffic Engineering
# PART 5. TRAFFIC CONTROL DEVICES FOR LOW-VOLUME ROADS

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CHAPTER 5A.  GENERAL

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OMUTCD - English units are preferred.
CHAPTER 5A. GENERAL

Section 5A.01 Function

Support:

At some locations on low-volume roads, the use of traffic control devices might be needed to provide the road user limited, but essential, information regarding regulation, guidance, and warning.

Other Parts of this Manual contain criteria applicable to all low-volume roads; however, Part 5 specifically supplements and references the criteria for traffic control devices commonly used on low-volume roads.

Standard:

A low-volume road shall be defined for this Part of the Manual as follows:

A. A low-volume road shall be a facility lying outside of built-up areas of Cities, towns, and communities, and it shall have a traffic volume of less than 400 AADT.

B. A low-volume road shall not be a freeway, expressway, interchange ramp, freeway service road, or a road on a designated State highway system. In terms of highway classification, it shall be a variation of a conventional road or a special purpose road as defined in Section 2A.01.

C. A low-volume road shall be classified as either paved or unpaved.

Support:

Low-volume roads typically include farm-to-market, recreational, resource management and development, and local roads.

Guidance:

The needs of unfamiliar road users for occasional, recreational, and commercial transportation purposes should be considered.

Section 5A.02 Application

Support:

It is possible, in many cases, to provide essential information to road users on low-volume roads with a limited number of traffic control devices. The focus might be on devices that:

A. Warn of conditions not normally encountered;

B. Prohibit unsafe movements; or

C. Provide minimal destination guidance.

As with other roads, the application of traffic control devices on low-volume roads is based on engineering judgment or studies.

Standard:

The criteria contained in Part 5 shall not prohibit the installation nor the full application of traffic control devices on a low-volume road where conditions justify their use.

Guidance:

Additional traffic control devices and criteria contained in other Parts of the Manual should be considered for use on low-volume roads.

Section 5A.03 Design

Standard:

Traffic control devices for use on low-volume roads shall be designed in accordance with the criteria contained in Part 5, and where required, in other applicable Parts of this Manual.
The typical sizes for signs installed on low-volume roads shall be as shown in Table 5A-1. The Minimum sign sizes shall only be used on low-volume roads where the 85th-percentile speed or posted speed limit is less than 60 km/h (35 mph).

All signs shall be retroreflective or illuminated to show the same shape and similar color both day and night, unless specifically stated otherwise in other applicable Parts of this Manual. The requirements for sign illumination shall not be considered to be satisfied by street, highway, or strobe lighting.

All markings shall be visible at night and shall be retroreflective unless ambient illumination provides adequate visibility of the markings.

Guidance:

Oversized sign sizes should be used where engineering judgment indicates a need based on high vehicle operating speeds, driver expectancy, traffic operations, or roadway conditions.

Section 5A.04 Placement

Standard:

The traffic control devices used on low-volume roads shall be placed and positioned in accordance with the criteria contained in Part 5 and, where necessary, in accordance with the lateral, longitudinal, and vertical placement criteria contained in Part 2 and other applicable Sections of this Manual.

Guidance:

The placement of warning signs should conform to the guidance contained in Section 2C.05 and other applicable Sections of this Manual.

Option:

A lateral offset of not less than 0.6 m (2 ft) from the roadway edge to the roadside edge of a sign may be used where roadside features such as terrain, shrubbery, and/or trees prevent lateral placement in accordance with Section 2A.19.

Standard:

If located within a clear zone, ground-mounted sign supports shall be yielding, breakaway, or shielded with a longitudinal barrier or crash cushion as required in Section 2A.19.
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<thead>
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<td>Typical</td>
</tr>
<tr>
<td><strong>STOP</strong></td>
<td>R1-1</td>
<td>5B.02</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td><strong>YIELD</strong></td>
<td>R1-2</td>
<td>5B.02</td>
<td>750 x 750 x 750 (30 x 30 x 30)</td>
</tr>
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<td>Speed Limit</td>
<td>R2-1</td>
<td>5B.03</td>
<td>600 x 750 (24 x 30)</td>
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<tr>
<td><strong>DO NOT PASS</strong></td>
<td>R4-1</td>
<td>5B.04</td>
<td>600 x 750 (24 x 30)</td>
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<tr>
<td><strong>PASS WITH CARE</strong></td>
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<td>5B.04</td>
<td>600 x 750 (24 x 30)</td>
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<tr>
<td>Keep Right</td>
<td>R4-7</td>
<td>5B.04</td>
<td>600 x 750 (24 x 30)</td>
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<tr>
<td><strong>DO NOT ENTER</strong></td>
<td>R5-1</td>
<td>5B.04</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>No Trucks</td>
<td>R5-2</td>
<td>5B.04</td>
<td>600 x 600 (24 x 24)</td>
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<td>One Way</td>
<td>R6-2</td>
<td>5B.04</td>
<td>450 x 600 (18 x 24)</td>
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<td>No Parking</td>
<td>R8-3</td>
<td>5B.05</td>
<td>450 x 600 (18 x 24)</td>
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<td>No Parking (symbol)</td>
<td>R8-3a</td>
<td>5B.05</td>
<td>600 x 600 (24 x 24)</td>
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<td><strong>NO PARKING</strong></td>
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<td>Road Closed</td>
<td>R11-2</td>
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<td>1200 x 750 (48 x 30)</td>
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<td>Road Closed, Local Traffic Only</td>
<td>R11-3a</td>
<td>5B.04</td>
<td>1500 x 750 (60 x 30)</td>
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<tr>
<td>Bridge Out, Local Traffic Only</td>
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<td>5B.04</td>
<td>1500 x 750 (60 x 30)</td>
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<td>R12-1</td>
<td>5B.04</td>
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<td>R15-1</td>
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<td>1200 x 225 (48 x 9)</td>
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<td>Horizontal Alignment</td>
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<tr>
<td>One-Direction Large Arrow</td>
<td>W1-6</td>
<td>5C.02</td>
<td>900 x 450 (36 x 18)</td>
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<td>Two-Direction Large Arrow</td>
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<td>Chevron Alignment</td>
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<td>Intersection Warning</td>
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<td><strong>Stop Ahead</strong></td>
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<td><strong>BE PREPARED TO STOP</strong></td>
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OMUTCD - English units are preferred.
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<tr>
<td></td>
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</tr>
<tr>
<td>LOOSE GRAVEL</td>
<td>W8-7</td>
<td>5G.05</td>
<td>750 x 750</td>
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<td>(30 x 30)</td>
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<td>Railroad Advance Warning</td>
<td>W10-1</td>
<td>5F.03</td>
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<tr>
<td></td>
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<td></td>
<td>(24 Dia.)</td>
</tr>
<tr>
<td>Crossing Warning</td>
<td>W10-2, 3, 4</td>
<td>5F.03</td>
<td>750 x 750</td>
</tr>
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<td>(30 x 30)</td>
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<td>Entering / Crossing</td>
<td>W11 series</td>
<td>5C.09</td>
<td>600 x 600</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>(24 x 24)</td>
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<tr>
<td>Advisory Speed (plaque)</td>
<td>W13-1</td>
<td>5C.10</td>
<td>450 x 450</td>
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<tr>
<td></td>
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<tr>
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<td>W14-1, 2</td>
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<tr>
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<td>W14-1a, 2a</td>
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<td>W14-3</td>
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<td>W16-2</td>
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<td>600 x 450</td>
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</tr>
<tr>
<td>AHEAD (plaque)</td>
<td>W16-9p</td>
<td>5C.09</td>
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<td></td>
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<td>5C.12</td>
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<td></td>
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<td>W20-1</td>
<td>5G.05</td>
<td>900 x 900</td>
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<td>(36 x 36)</td>
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<tr>
<td>Flagger</td>
<td>W20-7a</td>
<td>5G.05</td>
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<td>Workers</td>
<td>W21-1a</td>
<td>5G.05</td>
<td>900 x 900</td>
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<td></td>
<td></td>
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<td>(36 x 36)</td>
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<td>FRESH OIL</td>
<td>W21-2</td>
<td>5G.05</td>
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<td>(24 x 24)</td>
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<tr>
<td>ROAD MACHINERY AHEAD</td>
<td>W21-3</td>
<td>5G.05</td>
<td>600 x 600</td>
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<td></td>
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<tr>
<td>SHOULDER WORK</td>
<td>W21-5</td>
<td>5G.05</td>
<td>600 x 600</td>
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<td>(24 x 24)</td>
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<tr>
<td>SURVEY CREW</td>
<td>W21-6</td>
<td>5G.05</td>
<td>750 x 750</td>
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<td></td>
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<tr>
<td>Construction Arrow</td>
<td>W1-H11</td>
<td>6F.44.1</td>
<td>750 x 750</td>
</tr>
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<td></td>
<td></td>
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Notes: 1. Larger signs may be used when appropriate.
2. Dimensions are shown in millimeters followed by inches in parentheses and are shown as width x height.
3. The Minimum sign sizes shall only be used on low-volume roads where the 85th-percentile speed or posted speed limit is less than 60 km/h (35 mph).
CHAPTER 5B. REGULATORY SIGNS

Section 5B.01  Introduction

Support:

The purpose of a regulatory sign is to inform highway users of traffic laws or regulations, and to indicate the applicability of legal requirements that would not otherwise be apparent.

The criteria for regulatory signs are contained in Chapter 2B and in other Sections of this Manual. Criteria for regulatory signs that are specific to low-volume roads are contained in this Chapter.

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

Guidance:

STOP (R1-1) and YIELD (R1-2) signs (see Figure 5B-1) should be considered for use on low-volume roads where engineering judgment or a study, consistent with the provisions of Sections 2B.04 to 2B.10, indicates that either of the following conditions applies:

A. An intersection of a less-important road with a main road where application of the normal right-of-way rule might not be readily apparent.
B. An intersection that has restricted sight distance for the prevailing vehicle speeds.

Section 5B.03  Speed Limit Signs (R2 Series)

Standard:

If used, Speed Limit (R2 series) signs (see Figure 5B-1) shall display the speed limit established by law, ordinance, regulation, or as adopted by the authorized agency following an engineering study. The speed limits shown shall be in multiples of 5 miles per hour.

Speed limits shall be established in accordance with Section 2B.13.

Speed Limit signs shall be used where statutory speed limits are changed by an authorized Speed Zone except that, when the authorized Speed Zone falls within the limits of a School Zone, there should be no Speed Limit signs (except School Speed Limit signs) erected or in place within the School Zone.

Option:

Speed limit signs may be used on low-volume roads that carry traffic from, onto, or adjacent to higher-volume roads that have posted speed limits.

Section 5B.04  Traffic Movement and Prohibition Signs (R3, R4, R5, R6, R9, R10, R11, R12, R13, and R14 Series)

Support:

The regulatory signs (see Figure 5B-1) in these series inform road users of required, permitted, or prohibited traffic movements involving turn, alignment, exclusion, and pedestrians.

Standard:

If used, signs for traffic prohibitions or restrictions shall be placed in advance of the prohibition or restriction so that traffic can use an alternate route or turn around.

Guidance:

Signs should be used on low-volume roads to indicate traffic prohibitions and restrictions such as road closures and weight restrictions.
**Figure 5B-1. Regulatory Signs on Low-Volume Roads**

Option:

These signs may be useful on a low-volume road near and at the intersections or the connections with a higher class of road, and where the regulatory message is essential for reasonably safe transition from the low-volume road to the higher-class facility and vice versa.

Section 5B.05  **Parking Signs (R8 Series)**

Option:

Parking signs (see Figure 5B-2) may be installed selectively on low-volume roads with due consideration of enforcement.
Section 5B.06  Other Regulatory Signs

Standard:

Other regulatory signs used on low-volume roads that are not discussed in Part 5 shall conform with the criteria contained in other Parts of this Manual.

---

**Figure 5B-2. Parking Signs on Low-Volume Roads**

- R8-3: NO PARKING
- R8-3a: ON PAVEMENT
- R8-3c: Supplemental Plaque
- R8-3d: Supplemental Plaque

OMUTCD - English units are preferred.
Intentionally blank.
CHAPTER 5C. WARNING SIGNS

Section 5C.01 Introduction

Support:

The purpose of a warning sign is to provide advance warning to the road user of unexpected conditions on or adjacent to the roadway that might not be readily apparent.

The criteria for warning signs are contained in Chapter 2C and in other Sections of this Manual. Criteria for warning signs that are specific to low-volume roads are contained in this Chapter.

Section 5C.02 Horizontal Alignment Signs (W1-1 through W1-8)

Support:

Horizontal Alignment signs (see Figure 5C-1) include turn, curve, reverse turn, reverse curve, winding road, large arrow, and chevron alignment signs.

Option:

Horizontal Alignment signs may be used where engineering judgment indicates a need to inform the road user of a change in the horizontal alignment of the roadway.

Section 5C.03 Intersection Warning Signs (W2-1 through W2-5)

Support:

Intersection signs (see Figure 5C-1) include the crossroad, side road, T-symbol, and Y-symbol signs.

Option:

Intersection signs may be used where engineering judgment indicates a need to inform the road user in advance of an intersection.

Section 5C.04 Stop Ahead and Yield Ahead Signs (W3-1, W3-2)

Standard:

A Stop Ahead (W3-1) sign (see Figure 5C-2) shall be used where a STOP sign is not visible for a sufficient distance to permit the road user to bring the vehicle to a stop at the STOP sign.

A Yield Ahead (W3-2) sign (see Figure 5C-2) shall be used where a YIELD sign is not visible for a sufficient distance to permit the road user to bring the vehicle to a stop, if necessary, at the YIELD sign.

Option:

Word message (W3-1a and W3-2a) signs may be used as alternates to symbol signs.

Section 5C.05 NARROW BRIDGE Sign (W5-2)

Option:

The NARROW BRIDGE (W5-2) sign (see Figure 5C-2) may be used on an approach to a bridge or culvert that has a clear width less than that of the approach roadway.

Section 5C.06 ONE LANE BRIDGE Sign (W5-3)

Guidance:

A ONE LANE BRIDGE (W5-3) sign (see Figure 5C-2) should be used on low-volume two-way roadways in advance of any bridge or culvert:

A. Having a clear roadway width of less than 4.9 m (16 ft); or
B. Having a clear roadway width of less than 5.5 m (18 ft) when commercial vehicles constitute a high proportion of the traffic; or  
C. Having a clear roadway width of 5.5 m (18 ft) or less where the approach sight distance is limited on the approach to the structure.

Option:  
Roadway alignment and additional warning may be provided on the approach to a bridge or culvert by the use of object markers and/or delineators.

Section 5C.07  Hill Sign (W7-1)
Option:  
An engineering study of vehicles and road characteristics, such as percent grade and length of grade, may be conducted to determine hill signing requirements.

The use of the Hill (W7-1) sign (see Figure 5C-2) on low-volume roads may be confined to roads where commercial or recreational vehicles are anticipated.

Word messages (W7-1a) may be used as alternates to symbols.

Section 5C.08  PAVEMENT ENDS Sign (W8-3)
Option:  
A PAVEMENT ENDS (W8-3) sign (see Figure 5C-2) may be used to warn road users where a paved surface changes to a gravel or earth road surface.

Section 5C.09  Vehicular Traffic and Nonvehicular Signs (W11 Series and W8-6)
Guidance:  
Vehicular Traffic signs (see Figure 5C-2) should be used to alert road users to frequent unexpected entries into the roadway by trucks, bicyclists, farm vehicles, fire trucks, and other vehicles. Such signs should be used only at locations where the road user’s sight distance is restricted or the activity would be unexpected.

Option:  
Nonvehicular signs (see Figure 5C-2) may be used to alert the road user to frequent unexpected entries into the roadway by pedestrian, animal, and other crossing activities that may cause potential conflicts.

A W7-3a, W16-2, or W16-9p supplemental plaque (see Figure 5C-2) with the legend NEXT XX MILES, XX FEET, or AHEAD may be installed below a Vehicular Traffic or Nonvehicular sign (see Sections 2C.40 and 2C. 41).

Guidance:  
If the activity is seasonal or temporary, the sign should be removed or covered when the crossing activity does not exist.

Section 5C.10  Advisory Speed Plaque (W13-1)
Option:  
An Advisory Speed (W13-1) plaque (see Figure 5C-1) may be mounted below a warning sign when the condition requires a reduced speed.
Section 5C.11  DEAD END or NO OUTLET Signs (W14-1, W14-1a, W14-2, W14-2a)

Option:

The DEAD END (W14-1) and NO OUTLET (W14-2) signs (see Figure 5C-2) and the DEAD END (W14-1a) and NO OUTLET (W14-2a) signs (see Figure 2C-3) may be used to warn road users of a road that has no outlet or that terminates in a dead end or cul-de-sac.

Guidance:

If used, these signs should be placed at a location that gives drivers of large commercial or recreational vehicles an opportunity to select a different route or turn around.

Section 5C.12  NO TRAFFIC SIGNS Sign (W18-1)

Option:

A W18-1 warning sign (see Figure 5C-2) with the legend NO TRAFFIC SIGNS may be used only on unpaved, low-volume roads to advise users that no signs are installed along the distance of the road. If used, the sign may be installed at the point where road users would enter the low-volume road or where, based on engineering judgment, the road user may need this information.

A W7-3a, W16-2, or W16-9p supplemental plaque (see Figure 5C-2) with the legend NEXT XX MILES, XX FEET, or AHEAD may be installed below the W18-1 sign when appropriate.

Section 5C.13  Other Warning Signs

Standard:

Other warning signs used on low-volume roads that are not discussed in Part 5, but are in this Manual, shall conform with the criteria contained in other Parts of this Manual. Warning signs that are not specified in this Manual shall conform to the criteria in Sections 2C.02 and 2C.03.
Figure 5C-1. Horizontal Alignment and Intersection Warning Signs on Low-Volume Roads

W1-1
W1-2
W1-3
W1-4
W1-5
W1-6
W1-7
W1-8
W13-1
W2-1
W2-4
W2-5

OMUTCD - English units are preferred.
Figure 5C-2. Other Warning Signs on Low-Volume Roads

- W3-1
- W3-2
- W5-2
- W5-3
- W7-1
- W7-3
- W7-3a
- W8-3
- W8-6
- W11-1
- W11-2
- W11-3
- W11-4
- W11-5
- W11-8
- W11-10
- W14-1
- W14-2
- W16-2
- W16-9p
- W18-1

OMUTCD - English units are preferred.
Intentionally blank.
CHAPTER 5D. GUIDE SIGNS

Section 5D.01  Introduction

Support:

The purpose of a guide sign is to inform road users regarding positions, directions, destinations, and routes.

The criteria for guide signs, in general, are contained in Chapters 2D through 2H and in other Sections of this Manual. Criteria for guide signs that are specific to low-volume roads are contained in this Chapter.

Guidance:

The familiarity of the road users with the road should be considered in determining the need for guide signs on low-volume roads.

Support:

Low-volume roads generally do not require guide signs to the extent that they are needed on higher classes of roads. Because guide signs are typically only beneficial as a navigational aid for road users who are unfamiliar with a low-volume road, guide signs might not be needed on low-volume roads that serve only local traffic.

Guidance:

If used, destination names should be as specific and descriptive as possible. Destinations such as campgrounds, ranger stations, recreational areas, and the like should be clearly indicated so that they are not interpreted to be communities or locations with road user services.

Option:

Guide signs may be used at intersections to provide information for road users returning to a higher class of roads.
Intentionally blank.
CHAPTER 5E. MARKINGS

Section 5E.01 Introduction
Support:

The purpose of markings on highways is to provide guidance and information for road users regarding roadway conditions and restrictions.

The criteria for markings, delineators, and object markers, in general, are contained in Part 3 and in other Sections of this Manual. Criteria for markings that are specific to low-volume roads are contained in this Chapter.

Section 5E.02 Centerline Markings
Standard:

Where centerline markings are installed, no-passing zone markings in conformance with Section 3B.02 shall also be installed.

Guidance:

Centerline markings should be used on paved low-volume roads where engineering judgment or an engineering study indicates a need for them.

Section 5E.03 Edge Line Markings
Support:

The purpose of edge line markings is to delineate the left or right edge of the roadway.

Guidance:

Edge line markings should be considered for use on paved low-volume roads based on engineering judgment or an engineering study.

Option:

Edge line markings may be placed on highways with or without centerline markings.

Edge line markings may be placed on paved low-volume roads for roadway features such as horizontal curves, narrow bridges, pavement width transitions, curvilinear alignment, and at other locations based on engineering judgment or an engineering study.

Section 5E.04 Delineators
Support:

The purpose of delineators is to enhance driver safety where it is desirable to call attention to a changed or changing condition such as abrupt roadway narrowing or curvature.

Option:

Delineators may be used on low-volume roads based on engineering judgment, such as for curves, T-intersections, and abrupt changes in the roadway width. In addition, they may be used to mark the location of driveways or other minor roads entering the low-volume road.

Section 5E.05 Object Markers
Support:

The purpose of object markers is to mark obstructions located within or adjacent to the roadway, such as bridge abutments, drainage structures, and other physical objects.
Guidance:

The end of a low-volume road should be marked with an end-of-roadway marker in conformance with Section 3C.04.

Option:

A Type III barricade may be used where engineering studies or judgment indicates a need for a more visible end-of-roadway treatment (see Section 3F.01).

Section 5E.06 Other Markings

Standard:

Other markings, such as stop lines, crosswalks, pavement legends, barricades, channelizing devices, and islands, used on low-volume roads shall conform with the criteria contained in this Manual.
CHAPTER 5F. TRAFFIC CONTROL FOR HIGHWAY-RAIL GRADE CROSSINGS

Section 5F.01 Introduction
Support:

The criteria for highway-rail grade crossing traffic control devices are contained in Part 8 and in other Sections of this Manual.

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

Section 5F.02 Highway-Rail Grade Crossing (Crossbuck) Sign (R15-1, R15-2)
Standard:

The Highway-Rail Grade Crossing (Crossbuck) (R15-1) sign (see Figure 5F-1) shall be used at all highway-rail grade crossings. For all low-volume roads, Crossbucks signs shall be used on the right side of each approach. If there are two or more tracks, the supplemental Number of Tracks (R15-2) sign (see Figure 5F-1) shall display the number of tracks and shall be installed below the Crossbuck sign.

A strip of retroreflective white material not less than 50 mm (2 in) 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 50 mm (2 in) 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 0.6 m (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.

Section 5F.03 Highway-Rail Grade Crossing Advance Warning Signs (W10 Series)
Standard:

Except as noted in the Option, a Highway-Rail Grade Crossing Advance Warning (W10-1) sign (see Figure 5F-1) shall be used on all low-volume roads in advance of every highway-rail grade crossing.

Option:

The Highway-Rail Grade Crossing Advance Warning sign may be omitted for highway-rail grade crossings that are flagged by train crews.

The W10-2, W10-3, and W10-4 signs (see Figure 5F-1) may be used on low-volume roads that run parallel to railroad tracks to warn road users making a turn that they will encounter a highway-rail grade crossing soon after making the turn.

Section 5F.04 STOP and YIELD Signs (R1-1, R1-2)
Option:

STOP (R1-1) or YIELD (R1-2) signs may be used at low-volume highway-rail grade crossings, at the discretion of the responsible jurisdiction, for crossings without automatic traffic control devices, consistent with the provisions of Sections 2B.04 to 2B.10.
OMUTCD - English units are preferred.

Standard:

A Stop Ahead (W3-1) sign or Yield Ahead (W3-2) sign shall be used in advance of a STOP or YIELD sign at a highway-rail grade crossing if the STOP or YIELD sign is not visible for a distance that enables the road user to bring the vehicle to a reasonably safe stop at the highway-rail grade crossing.

Use of STOP signs at highway-rail grade crossing shall be in accordance with Section 4511.61 of the Ohio Revised Code (see Appendix B2).

Section 5F.05 Pavement Markings

Guidance:

Pavement markings at highway-rail grade crossings should be used on paved low-volume roads, particularly if they are already deployed at most other highway-rail grade crossings within the immediate vicinity, or when the roadway has centerline markings.

Section 5F.06 Other Traffic Control Devices

Standard:

Other traffic control devices that are used at highway-rail grade crossings on low-volume roads, such as other signs, signals, and illumination that are not in this Chapter, shall conform with the criteria contained in Part 8 and other applicable Parts of this Manual.

---

*Figure 5F-1. Highway-Rail Grade Crossing Signs for Low-Volume Roads*
CHAPTER 5G. TEMPORARY TRAFFIC CONTROL ZONES

Section 5G.01 Introduction

Guidance:

The safety of road users, including pedestrians and bicyclists, as well as personnel in work zones, should be an integral and high priority element of every project in the planning, design, maintenance, and construction phases. Part 6 should be reviewed for additional criteria, specific details, and more complex temporary traffic control zone requirements. The following principles should be applied to temporary traffic control zones:

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

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

A Traffic Control Plan (see Section 6C.01) should be used for a temporary traffic control zone on a low-volume road to specify particular traffic control devices and features, or to reference typical drawings such as those contained in Part 6.

Support:

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

Section 5G.02 Applications

Guidance:

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

Option:

Maintenance activities may not require extensive temporary traffic control if the traffic volumes and speeds are low. The traffic applications shown in Figures 6H-1, 6H-11, 6H-15, and 6H-16 of Part 6 are among those that may be used on low-volume roads.

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

Section 5G.03 Channelization Devices

Standard:

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

To alert, guide, and direct road users reasonably safely through temporary traffic control zones on low-volume roads, tapers may be used to move a road user out of the traffic lane and around the work space using the spacing of devices that is described in Section 6F.58.

**Section 5G.04 Markings**

Guidance:

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

Option:

Interim pavement markings in a temporary traffic control zone may not be needed based on the criteria for these markings in Section 6F.72.
Section 5G.05  Other Traffic Control Devices

Standard:

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

Support:

Some of the signs that might be applicable in a temporary traffic control zone on a low-volume road are shown in Figure 5G-1.
## PART 6. TEMPORARY TRAFFIC CONTROL

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CHAPTER 6A. GENERAL

Section 6A.01  General

Support:

Whenever the acronym “TTC” is used in this Chapter, it refers to “temporary traffic control.”

Standard:

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:

When the normal function of the roadway is suspended, TTC planning provides for continuity of the movement of motor vehicle, bicycle, and pedestrian traffic (including accessible passage); transit operations; and access (and accessibility) to property and utilities.

The primary function of TTC is to provide for the reasonably safe and efficient movement of road users through or around TTC zones while reasonably protecting workers, responders to traffic incidents, and equipment.

Of equal importance to the public traveling through the TTC zone is the safety of workers performing the many varied tasks within the work space. TTC zones present constantly changing conditions that are unexpected by the road user. This creates an even higher degree of vulnerability for the workers and incident management responders on or near the roadway (see Section 6D.03). At the same time, the TTC zone provides for the efficient completion of whatever activity interrupted the normal use of the roadway.

Consideration for road user safety, worker and responder safety, and the efficiency of road user flow is an integral element of every TTC zone, from planning through completion. A concurrent objective of the TTC is the efficient construction and maintenance of the highway and the efficient resolution of traffic incidents.

No one set of TTC devices can satisfy all conditions for a given project or incident. At the same time, defining details that would be adequate to cover all applications is not practical. Instead, Part 6 displays typical applications that depict common applications of TTC devices. The TTC selected for each situation depends on type of highway, road user conditions, duration of operation, physical constraints, and the nearness of the work space or incident management activity to road users.

Improved road user performance might be realized through a well-prepared public relations effort that covers the nature of the work, the time and duration of its execution, the anticipated effects upon road users, and possible alternate routes and modes of travel. Such programs have been found to result in a significant reduction in the number of road users traveling through the TTC zone, which reduces the possible number of conflicts.

Standard:

TTC plans and devices shall be the responsibility of the authority of a public body or official having jurisdiction for guiding road users. There shall be adequate statutory authority for the implementation and enforcement of needed road user regulations, parking controls, speed zoning, and the management of traffic incidents. Such statutes shall provide sufficient flexibility in the application of TTC to meet the needs of changing conditions in the TTC zone.

Support:

Temporary facilities, including reasonably safe pedestrian routes around work sites, are also covered by the accessibility requirements of the Americans with Disabilities Act of 1990 (ADA) (Public Law 101-336, 104 Stat. 327, July 26, 1990. 42 USC 12101-12213 (as amended)).
Guidance:

The TTC plan should start in the planning phase and continue through the design, construction, and restoration phases. The TTC plans and devices should follow the principles set forth in Part 6. The management of traffic incidents should follow the principles set forth in Chapter 6I.

Option:

TTC plans may deviate from the typical applications described in Chapter 6H to allow for conditions and requirements of a particular site or jurisdiction.

Support:

The criteria of Part 6 apply to both rural and urban areas. A rural highway is normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians. An urban street is typically characterized by relatively low speeds, wide ranges of road user volumes, narrower roadway lanes, frequent intersections and driveways, significant pedestrian activity, and more businesses and houses.
CHAPTER 6B. FUNDAMENTAL PRINCIPLES

Section 6B.01 Fundamental Principles of Temporary Traffic Control

Support:

Whenever the acronym “TTC” is used in this Chapter, it refers to “temporary traffic control.”

Standard:

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:

Construction, maintenance, utility, and incident zones can all benefit from TTC to compensate for the unexpected or unusual situations faced by road users. When planning for TTC in these zones, it can be assumed that it is appropriate for road users to exercise caution. Even though road users are assumed to be using caution, special care is still needed in applying TTC techniques.

Special plans preparation and coordination with transit, other highway agencies, law enforcement and other emergency units, utilities, schools, and railroad companies might be needed to reduce unexpected and unusual road user operation situations.

During TTC activities, commercial vehicles might need to follow a different route from passenger vehicles because of bridge, weight, clearance, or geometric restrictions. Also, vehicles carrying hazardous materials might need to follow a different route from other vehicles. The Truck Route and Hazardous Materials signs are included in Sections 2B.51 and 2B.52, respectively.

Experience has shown that following the fundamental principles of Part 6 will assist road users and help protect workers in the vicinity of TTC zones.

Guidance:

Road user and worker safety and accessibility in TTC zones should be an integral and high-priority element of every project from planning through design and construction. Similarly, maintenance and utility work should be planned and conducted with the safety and accessibility of all motorists, bicyclists, pedestrians (including those with disabilities), and workers being considered at all times. If the TTC zone includes a highway-rail grade crossing, early coordination with the railroad company should take place.

Support:

Formulating specific plans for TTC at traffic incidents is difficult because of the variety of situations that can arise.

Guidance:

General plans or guidelines should be developed to provide safety for motorists, bicyclists, pedestrians, workers, enforcement/emergency officials, and equipment, with the following factors being considered:

A. The basic safety principles governing the design of permanent roadways and roadsides should also govern the design of TTC zones. The goal should be to route road users through such zones using roadway geometrics, roadside features, and TTC devices as nearly as possible comparable to those for normal highway situations.

B. A TTC plan, in detail appropriate to the complexity of the work project or incident, should be prepared and understood by all responsible parties before the site is occupied. Any changes in the TTC plan should be approved by an official knowledgeable (for example, trained and/or certified) in proper TTC practices.

Road user movement should be inhibited as little as practical, based on the following considerations:
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A. TTC at work and incident sites should be designed on the assumption that drivers will only reduce their speeds if they clearly perceive a need to do so (see Section 6C.01).
B. Frequent and abrupt changes in geometrics such as lane narrowing, dropped lanes, or main roadway transitions that require rapid maneuvers, should be avoided.
C. Provisions should be made for the reasonably safe operation of work, particularly on high-speed, high-volume roadways.
D. Road users should be encouraged to use alternative routes that do not include TTC zones.
E. Bicyclists and pedestrians, including those with disabilities, should be provided with access and reasonably safe passage through the TTC zone.
F. Roadway occupancy should be scheduled during off-peak hours and, if necessary, night work should be considered.
G. Early coordination with officials having jurisdiction over the affected cross streets and providing emergency services should occur before roadway or ramp closings.
H. Roadway occupancy and work completion time should be minimized to reduce exposure to potential hazards.

Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner while approaching and traversing TTC zones and incident sites. The following principles should be applied:

A. Adequate warning, delineation, and channelization should be provided to assist in guiding road users in advance of and through the TTC zone or incident site by using proper pavement marking, signing, or other devices that are effective under varying conditions. Providing information that is in usable formats by pedestrians with visual disabilities should also be considered.
B. TTC devices inconsistent with intended travel paths through TTC zones should be removed or covered. However, in intermediate-term stationary, short-term, and mobile operations, where visible permanent devices are inconsistent with intended travel paths, devices that highlight or emphasize the appropriate path should be used. Providing traffic control devices that are accessible to and usable by pedestrians with disabilities should be considered.
C. Flagging procedures, when used, should provide positive guidance to road users traversing the TTC zone.

To provide acceptable levels of operations, routine day and night inspections of TTC elements should be performed as follows:

A. Individuals who are knowledgeable (for example, trained and/or certified) in the principles of proper TTC should be assigned responsibility for safety in TTC zones. The most important duty of these individuals should be to check that all TTC devices on the project are reasonably consistent with the TTC plan and are effective in providing reasonably safe conditions for motorists, bicyclists, pedestrians, and workers.
B. As the work progresses, temporary traffic controls and/or working conditions should be modified in order to provide reasonably safe and efficient road user movement and to provide worker safety. The individual responsible for TTC should have the authority to halt work until applicable or remedial safety measures are taken.
C. TTC zones should be carefully monitored under varying conditions of road user volumes, light, and weather to check that applicable TTC devices are effective, clearly visible, clean, and in compliance with the TTC plan.
D. When warranted, an engineering study should be made (in cooperation with law enforcement officials) of reported crashes occurring within the TTC zone. Crash records in TTC zones should be monitored to identify the need for changes in the TTC zone.

Attention should be given to the maintenance of roadside safety during the life of the TTC zone by applying the following principles:

A. To accommodate run-off-the-road incidents, disabled vehicles, or emergency situations, unencumbered roadside recovery areas or clear zones should be provided where practical.
B. Channelization of road users should be accomplished by the use of pavement markings, signing, and crashworthy, detectable channelizing devices.
C. Work equipment, workers' private vehicles, materials, and debris should be stored in such a manner to reduce the probability of being impacted by run-off-the-road vehicles.

Each person whose actions affect TTC zone safety, from the upper-level management through the field workers, should receive training appropriate to the job decisions each individual is required to make. Only those individuals who are trained in proper TTC practices and have a basic understanding of the principles (established by applicable standards and guidelines, including those of this Manual) should supervise the selection, placement, and maintenance of TTC devices used for TTC zones and for incident management.

Good public relations should be maintained by applying the following principles:

A. The needs of all road users should be assessed such that appropriate advance notice is given and clearly defined alternative paths are provided.
B. The cooperation of the various news media should be sought in publicizing the existence of and reasons for TTC zones because news releases can assist in keeping the road users well informed.
C. The needs of abutting property owners, residents, and businesses should be assessed and appropriate accommodations made.
D. The needs of emergency service providers (law enforcement, fire, and medical) should be assessed and appropriate coordination and accommodations made.
E. The needs of railroads and transit should be assessed and appropriate coordination and accommodations made.
F. The needs of operators of commercial vehicles such as buses and large trucks should be assessed and appropriate accommodations made.

Standard:

Before any new detour or temporary route is opened to traffic, all necessary signs shall be in place.

All TTC devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, TTC devices that are no longer appropriate shall be removed or covered.
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CHAPTER 6C. TEMPORARY TRAFFIC CONTROL ELEMENTS

Section 6C.01 Temporary Traffic Control Plans

Support:

Whenever the acronym “TTC” is used in this Chapter, it refers to “temporary traffic control.”

Standard:

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:

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

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

Guidance:

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

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

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

Provisions for effective continuity of accessible circulation paths for pedestrians should be incorporated into the TTC process. Where existing pedestrian routes are blocked or detoured, information should be provided about alternative routes that are usable by pedestrians with disabilities, particularly those who have visual disabilities. Access to temporary bus stops, reasonably safe travel across intersections with accessible pedestrian signals (see Section 4E.06), and other routing issues should be considered where temporary pedestrian routes are channelized. Barriers and channelizing devices that are detectable by people with visual disabilities should be provided.

Option:

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

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

Guidance:

This alternate or modified plan should have the approval of the responsible highway agency prior to implementation.
Provisions for effective continuity of transit service should be incorporated into the TTC planning process because often public transit buses cannot efficiently be detoured in the same manner as other vehicles (particularly for short-term maintenance projects). Where applicable, the TTC plan should provide for features such as accessible temporary bus stops, pull-outs, and satisfactory waiting areas for transit patrons, including persons with disabilities, if applicable (see Section 10A.05 for additional light rail transit issues to consider for TTC).

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

Reduced speed limits should be used only in the specific portion of the TTC zone where conditions or restrictive features are present. However, frequent changes in the speed limit should be avoided. A TTC plan should be designed so that vehicles can reasonably safely travel through the TTC zone with a speed limit reduction of no more than 16 km/h (10 mph).

A reduction of more than 16 km/h (10 mph) in the speed limit should be used only when required by restrictive features in the TTC zone. Where restrictive features justify a speed reduction of more than 16 km/h (10 mph), additional driver notification should be provided. The speed limit should be stepped down in advance of the location requiring the lowest speed, and additional TTC warning devices should be used.

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

Support:

Research has demonstrated that large reductions in the speed limit, such as a 50 km/h (30 mph) reduction, increase speed variance and the potential for crashes. Smaller reductions in the speed limit of up to 16 km/h (10 mph) cause smaller changes in speed variance and lessen the potential for increased crashes. A reduction in the regulatory speed limit of only up to 16 km/h (10 mph) from the normal speed limit has been shown to be more effective.

Section 4511.21 of the Ohio Revised Code establishes how speed limits may be reduced and Part 6 of the ODOT “Traffic Engineering Manual” (see Section 1A.11) provides additional information on speeds in TTC zones.

**Section 6C.02  Temporary Traffic Control Zones**

Support:

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

A work zone is an area of a highway with construction, maintenance, or utility work activities. A work zone is typically marked by signs, channelizing devices, barriers, pavement markings, and/or work vehicles. It extends from the first warning sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to the END ROAD WORK sign or the last TTC device.

An incident area is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a traffic incident (see Section 6I.01) or special event. It extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where road users return to the original lane alignment and are clear of the incident.

**Section 6C.03  Components of Temporary Traffic Control Zones**

Support:

Most TTC zones are divided into four areas: the advance warning area, the transition area, the activity area, and the termination area. Figure 6C-1 illustrates these four areas. These four areas are described in Sections 6C.04 through 6C.07.
Figure 6C-1. Component Parts of a Temporary Traffic Control Zone

Legend

- Direction of travel

- Downstream Taper

- Buffer Space (longitudinal)

- Work Space is set aside for workers, equipment, and material storage

- Activity Area is where work takes place

- Buffer Space (longitudinal) provides protection for traffic and workers

- Transition Area moves traffic out of its normal path

- Shoulder Taper

- Advance Warning Area tells traffic what to expect ahead

Traffic Space allows traffic to pass through the activity area

Buffer Space (lateral) provides protection for traffic and workers

OMUTCD - English units are preferred.
Table 6C-1. Suggested Advance Warning Sign Spacing

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Distance Between Signs **</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Urban (low speed) *</td>
<td>30 (100)</td>
</tr>
<tr>
<td>Urban (high speed) *</td>
<td>100 (350)</td>
</tr>
<tr>
<td>Rural</td>
<td>150 (500)</td>
</tr>
<tr>
<td>Expressway/Freeway</td>
<td>300 (1,000)</td>
</tr>
</tbody>
</table>

* Speed category to be determined by highway agency.

** Distances are shown in meters (feet). The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The third sign is the first one in a three-sign series encountered by a driver approaching a TTC zone.)

Section 6C.04  Advance Warning Area

Support:

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

Option:

The advance warning area may vary from a single sign or high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle to a series of signs in advance of the TTC zone activity area.

Guidance:

Typical distances for placement of advance warning signs on freeways and expressways should be longer because drivers are conditioned to uninterrupted flow. Therefore, the advance warning sign placement should extend on these facilities as far as 800 m (0.5 mi) or more.

On urban streets, the effective placement of the first warning sign in meters (feet) should range from 0.75 to 1.5 times the speed limit in km/h (4 to 8 times the speed limit in mph), with the high end of the range being used when speeds are relatively high. When a single advance warning sign is used (in cases such as low-speed residential streets), the advance warning area can be as short as 30 m (100 ft). When two or more advance warning signs are used on higher-speed streets, such as major arterials, the advance warning area should extend a greater distance (see Table 6C-1).

Since rural highways are normally characterized by higher speeds, the effective placement of the first warning sign in meters (feet) should be substantially longer—from 1.5 to 2.25 times the speed limit in km/h (8 to 12 times the speed limit in mph). Since two or more advance warning signs are normally used for these conditions, the advance warning area should extend 450 m (1,500 ft) or more for open highway conditions (see Table 6C-1).

Option:

Advance warning may be eliminated when the activity area is sufficiently removed from the road users’ path so that it does not interfere with the normal flow.
Section 6C.05  Transition Area

Support:

The transition area is that section of highway where road users are redirected out of their normal path. Transition areas usually involve strategic use of tapers, which because of their importance are discussed separately in detail.

Standard:

When redirection of the road users’ normal path is required, they shall be channelized from the normal path to a new path.

Support:

In mobile operations, the transition area moves with the work space.

Section 6C.06  Activity Area

Support:

The activity area is the section of the highway where the work activity takes place. It is comprised of the work space, the traffic space, and the buffer space.

The work space is that portion of the highway closed to road users and set aside for workers, equipment, and material, and a shadow vehicle if one is used upstream. Work spaces are usually delineated for road users by channelizing devices or, to exclude vehicles and pedestrians, by temporary barriers.

Option:

The work space may be stationary or may move as work progresses.

Guidance:

Since there might be several work spaces (some even separated by several kilometers or miles) within the project limits, each work space should be adequately signed to inform road users and reduce confusion.

Support:

The traffic space is the portion of the highway in which road users are routed through the activity area.

The buffer space is a lateral and/or longitudinal area that separates road user flow from the work space or an unsafe area, and might provide some recovery space for an errant vehicle.

Guidance:

Neither work activity nor storage of equipment, vehicles, or material should occur within a buffer space.

Option:

Buffer spaces may be positioned either longitudinally or laterally with respect to the direction of road user flow. The activity area may contain one or more lateral or longitudinal buffer spaces.

A longitudinal buffer space may be placed in advance of a work space.

The longitudinal buffer space may also be used to separate opposing road user flows that use portions of the same traffic lane, as shown in Figure 6C-2.

If a longitudinal buffer space is used, the values shown in Table 6C-2 may be used to determine the length of the longitudinal buffer space.

Support:

Typically, the buffer space is formed as a traffic island and defined by channelizing devices.
When a shadow vehicle, arrow panel, or changeable message sign is placed in a closed lane in advance of a work space, only the area upstream of the vehicle, arrow panel, or changeable message sign constitutes the buffer space.

Option:

The lateral buffer space may be used to separate the traffic space from the work space, as shown in Figures 6C-1 and 6C-2, or such areas as excavations or pavement-edge drop-offs. A lateral buffer space also may be used between two travel lanes, especially those carrying opposing flows.

Guidance:

The width of a lateral buffer space should be determined by engineering judgment.

Option:

When work occurs on a high-volume, highly congested facility, a vehicle storage or staging space may be provided for incident response and emergency vehicles (for example, tow trucks and fire apparatus) so that these vehicles can respond quickly to road user incidents.

Guidance:

If used, an incident response and emergency-vehicle storage area should not extend into any portion of the buffer space.

Section 6C.07 Termination Area

Standard:

The termination area shall be used to return road users to their normal path. The termination area shall extend from the downstream end of the work area to the last TTC device such as END ROAD WORK signs, if posted.

Option:

An END ROAD WORK sign, a Speed Limit sign, or other signs may be used to inform road users that they can resume normal operations.

A longitudinal buffer space may be used between the work space and the beginning of the downstream taper.

Section 6C.08 Tapers

Option:

Tapers may be used in both the transition and termination areas. Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the length of the tapers may be adjusted.

Support:

Tapers are created by using a series of channelizing devices and/or pavement markings to move traffic out of or into the normal path. Types of tapers are shown in Figure 6C-2.

Longer tapers are not necessarily better than shorter tapers (particularly in urban areas with characteristics such as short block lengths or driveways) because extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily. The test concerning adequate lengths of tapers involves observation of driver performance after TTC plans are put into effect.

Guidance:

The appropriate taper length (L) should be determined using the criteria shown in Tables 6C-3 and 6C-4.

The maximum distance in meters (feet) between devices in a taper should not exceed 0.2 times the speed limit in km/h (1.0 times the speed limit in mph).

OMUTCD - English units are preferred.
Figure 6C-2. Types of Tapers and Buffer Spaces

- Merging Taper
- Longitudinal Buffer Space (optional)
- Shifting Taper *
- Downstream Taper (optional)
- Lateral Buffer Space (optional)
- Longitudinal Buffer Space (optional)
- Shifting Taper *
- 0.6S m if S is in km/h (4S ft if S is in mph)
- Longitudinal Buffer Space (optional)
- 1/3 L Shoulder Taper

* A shifting taper should be L when the speed is greater than or equal to 50 mph, and may be 0.5L when the speed is less than 50 mph.
Table 6C-2. Stopping Sight Distance as a Function of Speed

<table>
<thead>
<tr>
<th>Speed * (km/h)</th>
<th>Distance (m)</th>
<th>Speed * (mph)</th>
<th>Distance (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>35</td>
<td>20</td>
<td>115</td>
</tr>
<tr>
<td>40</td>
<td>50</td>
<td>25</td>
<td>155</td>
</tr>
<tr>
<td>50</td>
<td>65</td>
<td>30</td>
<td>200</td>
</tr>
<tr>
<td>60</td>
<td>85</td>
<td>35</td>
<td>250</td>
</tr>
<tr>
<td>70</td>
<td>105</td>
<td>40</td>
<td>305</td>
</tr>
<tr>
<td>80</td>
<td>130</td>
<td>45</td>
<td>360</td>
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<tr>
<td>90</td>
<td>160</td>
<td>50</td>
<td>425</td>
</tr>
<tr>
<td>100</td>
<td>185</td>
<td>55</td>
<td>495</td>
</tr>
<tr>
<td>110</td>
<td>220</td>
<td>60</td>
<td>570</td>
</tr>
<tr>
<td>120</td>
<td>250</td>
<td>65</td>
<td>645</td>
</tr>
<tr>
<td>70</td>
<td>730</td>
<td>70</td>
<td>730</td>
</tr>
<tr>
<td>75</td>
<td>820</td>
<td>75</td>
<td>820</td>
</tr>
</tbody>
</table>

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed.

Support:

A merging taper requires the longest distance because drivers are required to merge into common road space.

Guidance:

A merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds and merge into a single lane before the end of the transition.

Support:

A shifting taper is used when a lateral shift is needed. When more space is available, a longer than minimum taper distance can be beneficial. Changes in alignment can also be accomplished by using horizontal curves designed for normal highway speeds.

Guidance:

Where speeds are 50 miles per hour or greater, a shifting taper should be approximately L in length.

Option:

Where speeds are less than 50 miles per hour, the shifting taper may be approximately 0.5L.

Support:

A shoulder taper may be beneficial on a high-speed roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane. In these instances, the same type, but abbreviated, closure procedures used on a normal portion of the roadway can be used.

OMUTCD - English units are preferred.
Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

<table>
<thead>
<tr>
<th>Type of Taper</th>
<th>Taper Length (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merging Taper</td>
<td>at least L</td>
</tr>
<tr>
<td>Shifting Taper</td>
<td>0.5 L when speed is &lt; 50 mph, and ( L ) when speed is ( \geq 50 ) mph</td>
</tr>
<tr>
<td>Shoulder Taper</td>
<td>at least 0.33 L</td>
</tr>
<tr>
<td>One-Lane, Two-way Traffic Taper</td>
<td>300 m (100 ft) maximum</td>
</tr>
<tr>
<td>Downstream Taper</td>
<td>30 m (100 ft) per lane</td>
</tr>
</tbody>
</table>

Table 6C-4. Formulas for Determining Taper Lengths

\[
\begin{array}{|c|c|}
\hline
\text{Speed Limit (S)} & \text{Taper Length (L) Meters} \\
\hline
60 \text{ km/h or less} & L = \frac{WS^2}{155} \\
70 \text{ km/h or more} & L = \frac{WS}{1.6} \\
\hline
\end{array}
\]

\[
\begin{array}{|c|c|}
\hline
\text{Speed Limit (S)} & \text{Taper Length (L) Feet} \\
\hline
40 \text{ mph or less} & L = \frac{WS^2}{60} \\
45 \text{ mph or more} & L = WS \\
\hline
\end{array}
\]

Where: \( L \) = taper length in meters (feet)  
\( W \) = width of offset in meters (feet)  
\( S \) = posted speed limit, of off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in km/h (mph)

Guidance:

If used, shoulder tapers should have a length of approximately 0.33 \( L \) (see Tables 6C-3 and 6C-4). If a shoulder is used as a travel lane, either through practice or during a TTC activity, a normal merging or shifting taper should be used.

Option:

A downstream taper may be useful in termination areas to provide a visual cue to the driver that access is available back into the original lane or path that was closed.

Guidance:

When used, a downstream taper should have a length of approximately 30 m (100 ft) per lane with devices placed at a spacing of approximately 6.1 m (20 ft).

Support:

The one-lane, two-way taper is used in advance of an activity area that occupies part of a two-way roadway in such a way that a portion of the road is used alternately by traffic in each direction.
Guidance:

Traffic should be controlled by a flagger or temporary traffic control signal (if sight distance is limited), or a STOP or YIELD sign. A short taper having a maximum length of 30 m (100 ft) with channelizing devices at approximately 6.1 m (20 ft) spacings should be used to guide traffic into the one-way section.

Support:

An example of a one-lane, two-way traffic taper is shown in Figure 6C-3.

Section 6C.09  Detours and Diversions

Support:

A detour is a temporary rerouting of road users onto an existing highway in order to avoid a TTC zone.

Guidance:

Detours should be clearly signed over their entire length so that road users can easily use existing highways to return to the original highway.

Support:

A diversion is a temporary rerouting of road users onto a temporary highway or alignment placed around the work area.

Section 6C.10  One-Lane, Two-Way Traffic Control

Standard:

When traffic in both directions must use a single lane for a limited distance, movements from each end shall be coordinated.

Guidance:

Provisions should be made for alternate one-way movement through the constricted section via methods such as flagger control, a flag transfer, a pilot car, traffic control signals, or stop or yield control.

Control points at each end should be chosen to permit easy passing of opposing lanes of vehicles.

If traffic on the affected one-lane roadway is not visible from one end to the other, then flagging procedures, a pilot car with a flagger used as described in Section 6F.54, or a traffic control signal should be used to control opposing traffic flows.

Support:

At a spot constriction, such as an isolated pavement patch on highways with lower speeds and adequate sight distance, the movement of traffic through one-lane, two-way constrictions tends to be self-regulating.

Section 6C.11  Flagger Method of One-Lane, Two-Way Traffic Control

Option:

When a one-lane, two-way TTC zone is short enough to allow a flagger to see from one end of the zone to the other, traffic may be controlled by either a single flagger or by a flagger at each end of the section.

Guidance:

When a single flagger is used, the flagger should be stationed on the shoulder opposite the constriction or work space, or in a position where good visibility and traffic control can be maintained at all times. When good visibility and traffic control cannot be maintained by one flagger station, traffic should be controlled by a flagger at each end of the section. One of the flaggers should be designated as the coordinator. Flaggers should be able to communicate with each other orally, electronically, or with manual signals. These manual signals should not be mistaken for flagging signals.
Section 6C.12  Flag Transfer Method of One-Lane, Two-Way Traffic Control

Support:

The driver of the last vehicle proceeding into the one-lane section is given a red flag (or other token) and instructed to deliver it to the flagger at the other end. The opposite flagger, upon receipt of the flag, then knows that it is reasonably safe to allow traffic to move in the other direction. A variation of this method is to replace the use of a flag with an official pilot car that always follows the last road user vehicle proceeding through the section.

Guidance:

The flag transfer method should be employed only where the one-way traffic is confined to a relatively short length of a road, usually not more than 1.6 km (1 mi) in length.

Section 6C.13  Pilot Car Method of One-Lane, Two-Way Traffic Control

Option:

A pilot car may be used to guide a queue of vehicles through the TTC zone or detour.

Guidance:

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

Standard:

The PILOT CAR FOLLOW ME (G20-4) sign (see Figure 6F-4, Sheet 4 of 4) shall be mounted at a conspicuous location on the rear of the vehicle.

Section 6C.14  Temporary Traffic Control Signal Method of One-Lane, Two-Way Traffic Control

Option:

Traffic control signals may be used to control vehicular traffic movements in one-lane, two-way TTC zones (see Figure 6H-12 and Chapter 4G).

Section 6C.15  Stop or Yield Control Method of One-Lane, Two-Way Traffic Control

Option:

STOP or YIELD signs may be used to control traffic on low-volume roads at a one-lane, two-way TTC zone when drivers are able to see the other end of the one-lane, two-way operation and have sufficient visibility of approaching vehicles.

Guidance:

If the STOP or YIELD sign is installed for only one direction, then the STOP or YIELD sign should face road users who are driving on the side of the roadway that is closed for the work activity area.
Figure 6C-3. Example of a One-Lane, Two-Way Traffic Taper

OMUTCD - English units are preferred.
CHAPTER 6D. PEDESTRIAN AND WORKER SAFETY

Section 6D.01 Pedestrian Considerations

Support:

Whenever the acronym “TTC” is used in this Chapter, it refers to “temporary traffic control.”

Standard:

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:

A wide range of pedestrians might be affected by TTC zones, including the young, elderly, and people with disabilities such as hearing, visual, or mobility. These pedestrians need a clearly delineated and usable travel path. Considerations for pedestrians with disabilities are addressed in Section 6D.02.

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

Guidance:

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

Standard:

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

Advance notification of sidewalk closures shall be provided to the maintaining agency. Where pedestrians with visual disabilities normally use the closed sidewalk, a barrier that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.

Support:

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

Guidance:

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

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

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

C. Pedestrians should be provided with a reasonably safe, convenient, and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s). Where pedestrians who have visual disabilities encounter work sites that require them to cross the roadway to find an accessible route, instructions should be provided using an audible information device. Accessible pedestrian signals (see Section 4E.06) with accessible pedestrian detectors (see Section 4E.09) might be needed to enable pedestrians with visual disabilities to cross wide or heavily traveled roadways.

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

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

Support:

Figures 6H-28 and 6H-29 show typical TTC device usage and techniques for pedestrian movement through work zones.

Guidance:

When pedestrian movement through or around a work site is necessary, a separate usable footpath should be provided. If the previous pedestrian facility was accessible to pedestrians with disabilities, the footpath provided during temporary traffic control should also be accessible. There should not be any abrupt changes in grade or terrain that could cause a tripping hazard or could be a barrier to wheelchair use. Barriers and channelizing devices should be detectable to pedestrians who have visual disabilities (see Section 6F.68).

Option:

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

Support:

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

Guidance:

Fencing should not create sight distance restrictions for road users. Fences should not be constructed of materials that would be hazardous if impacted by vehicles.

Wooden railing, fencing, and similar systems placed immediately adjacent to motor vehicle traffic should not be used as substitutes for crashworthy temporary traffic barriers.

Standard:

TTC devices used to delineate a TTC zone pedestrian walkway shall be crashworthy and, when struck by vehicles, present a minimum threat to pedestrians, workers, and occupants of impacting vehicles.
Guidance:

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

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

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

Option:

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

Guidance:

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

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

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

Support:

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

Standard:

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

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

Option

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

Support:

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

Guidance:

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

TTC devices, portable concrete barriers, and wood or chainlink fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.

Guidance:

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

The extent of pedestrian needs should be determined through engineering judgment for each TTC zone situation. In general, pedestrian routes should be preserved in urban and commercial suburban areas. Alternative routing should be discouraged.

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

Section 6D.02 Accessibility Considerations

Support:

Additional information on the design and construction of accessible temporary facilities is found in publications listed in Section 1A.11 (see Documents 10 and 29 through 31).

Guidance:

The extent of pedestrian needs should be determined through engineering judgment or by the individual responsible for each TTC zone situation. This individual should be aware that the absence of a continuous pathway, including curb ramps and other accessible features, might preclude the use of the facility by pedestrians with disabilities.

Standard:

When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.

Guidance:

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

A. Provisions for continuity of accessible paths for pedestrians should be incorporated into the TTC process. Pedestrians should be provided with a reasonably safe, convenient, and accessible path that replicates as much as practical the desirable characteristics of the existing pedestrian facilities.

B. Access to temporary transit stops should be provided.

C. Blocked routes, alternate crossings, and sign and signal information should be communicated to pedestrians with visual disabilities by providing devices such as audible information devices, accessible pedestrian signals, or barriers and channelizing devices that are detectable to the pedestrians traveling with the aid of a long cane or who have low vision. Where pedestrian traffic is detoured to a TTC signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals should be considered for crossings along an alternate route.

D. When channelization is used to delineate a pedestrian pathway, a continuous detectable edging should be provided throughout the length of the facility such that pedestrians using a long cane can follow it. These detectable edgings should adhere to the provisions of Section 6F.68.

E. A smooth, continuous hard surface should be provided throughout the entire length of the temporary pedestrian facility. There should be no curbs or abrupt changes in grade or terrain that could cause tripping or be a barrier to wheelchair use. The geometry and alignment of the facility should meet the applicable requirements of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)” (see Section 1A.11).
F. The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 1500 mm (60 in) throughout the entire length of the pedestrian pathway, a 1500 x 1500 mm (60 x 60 in) passing space should be provided at least every 60 m (200 ft), to allow individuals in wheelchairs to pass.

G. Signs and other devices mounted lower than 2.1 m (7 ft) above the temporary pedestrian pathway should not project more than 100 mm (4 in) into accessible pedestrian facilities.

Section 6D.03 Worker Safety Considerations

Support:

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

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

Guidance:

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

A. Training—all workers should be trained on how to work next to motor vehicle traffic in a way that minimizes their vulnerability. Workers having specific TTC responsibilities should be trained in TTC techniques, device usage, and placement.

B. Worker Safety Apparel—all workers exposed to the risks of moving roadway traffic or construction equipment should wear high-visibility safety apparel meeting the requirements of ISEA “American National Standard for High-Visibility Safety Apparel” (see Section 1A.11), or equivalent revisions, and labeled as ANSI 107-1999 standard performance for Class 1, 2, or 3 risk exposure. A competent person designated by the employer to be responsible for the worker safety plan within the activity area of the job site should make the selection of the appropriate class of garment.

C. Temporary Traffic Barriers—temporary traffic barriers should be placed along the work space depending on factors such as lateral clearance of workers from adjacent traffic, speed of traffic, duration and type of operations, time of day, and volume of traffic.

D. Speed Reduction—reducing the speed of vehicular traffic, mainly through regulatory speed zoning, funneling, lane reduction, or the use of uniformed law enforcement officers or flaggers, should be considered.

E. Activity Area—planning the internal work activity area to minimize backing-up maneuvers of construction vehicles should be considered to minimize the exposure to risk.

F. Worker Safety Planning—a competent person designated by the employer should conduct a basic hazard assessment for the work site and job classifications required in the activity area. This safety professional should determine whether engineering, administrative, or personal protection measures should be implemented. This plan should be in accordance with the Occupational Safety and Health Act of 1970, as amended, “General Duty Clause” Section 5(a)(1) - Public Law 91-596, 84 Stat. 1590, December 29, 1970, as amended, and with the requirement to assess worker risk exposures for each job site and job classification, as per 29 CFR 1926.20 (b)(2) of “Occupational Safety and Health Administration Regulations, General Safety and Health Provisions ” (see Section 1A.11).
Option:

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

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

B. Road Closure—if alternate routes are available to handle road users, the road may be closed temporarily. This may also facilitate project completion and thus further reduce worker vulnerability.

C. Law Enforcement Use—in highly vulnerable work situations, particularly those of relatively short duration, law enforcement units may be stationed to heighten the awareness of passing vehicular traffic and to improve safety through the TTC zone.

D. Lighting—for nighttime work, the TTC zone and approaches may be lighted.

E. Special Devices—these include rumble strips, changeable message signs, hazard identification beacons, flags, and warning lights. Intrusion warning devices may be used to alert workers to the approach of errant vehicles.

Support:

Judicious use of the special devices described in Item E above might be helpful for certain difficult TTC situations, but misuse or overuse of special devices or techniques might lessen their effectiveness.
CHAPTER 6E. FLAGGER CONTROL

Section 6E.01 Qualifications for Flaggers

Support:

Whenever the acronym “TTC” is used in this Chapter, it refers to “temporary traffic control.”

Standard:

A flagger shall be a person who provides TTC.

Guidance:

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

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

Section 6E.02 High-Visibility Safety Apparel

Standard:

For daytime and nighttime activity, flaggers shall wear safety apparel meeting the requirements of ISEA “American National Standard for High-Visibility Apparel” (see Section 1A.11) and labeled as meeting the ANSI107-1999 standard performance for Class 2 risk exposure. The apparel background (outer) material color shall be either fluorescent orange-red or fluorescent yellow-green as defined in the standard. The retroreflective material shall be either orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 300 m (1,000 ft). The retroreflective safety apparel shall be designed to clearly identify the wearer as a person.

Guidance:

For nighttime activity, safety apparel meeting the requirements of ISEA “American National Standard for High-Visibility Apparel” (see Section 1A.11) and labeled as meeting the ANSI 107-1999 standard performance for Class 3 risk exposure should be considered for flagger wear (instead of the Class 2 safety apparel in the Standard above).

When uniformed law enforcement officers are used, high-visibility safety apparel as described in this Section should be worn by the law enforcement officer.

Section 6E.03 Hand-Signaling Devices

Support:

Hand-signaling devices, such as STOP/SLOW paddles, lights, and red flags, are used to control road users through TTC zones.

Guidance:

The STOP/SLOW paddle should be the primary and preferred hand-signaling device because the STOP/SLOW paddle gives road users more positive guidance than red flags. Use of flags should be limited to emergency situations, intersections and low-speed and/or low-volume locations which can best be controlled by a single flagger.
Standard:

The STOP/SLOW paddle shall have an octagonal shape on a rigid handle. STOP/SLOW paddles shall be at least 450 mm (18 in) wide with letters at least 150 mm (6 in) high and should be fabricated from light semirigid material. The background of the STOP face shall be red with white letters and border. The background of the SLOW face shall be orange with black letters and border. When used at night, the STOP/SLOW paddle shall be retroreflectorized.

Option:

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

A. Two white or red lights, one centered vertically above and one centered vertically below the STOP legend; and/or two white or yellow lights, one centered vertically above and one centered vertically below the SLOW legend; or

B. Two white or red lights, one centered horizontally on each side of the STOP legend; and/or two white or yellow lights, one centered horizontally on each side of the SLOW legend; or

C. One white or red light centered below the STOP legend; and/or one white or yellow light centered below the SLOW legend; or

D. A series of eight or more small white or red lights no larger than 6 mm (0.25 in) in diameter along the outer edge of the paddle, arranged in an octagonal pattern at the eight corners of the border of the STOP face; and/or a series of eight or more small white or yellow lights no larger than 6 mm (0.25 in) in diameter along the outer edge of the paddle, arranged in a diamond pattern along the border of the SLOW face.

E. A series of white lights forming the shapes of the letters in the legend.

Standard:

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

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

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

Flags, when used, shall be a minimum of 600 mm (24 in) square, made of a good grade of red material, and securely fastened to a staff that is approximately 900 mm (36 in) in length.

Guidance:

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

Standard:

When used at nighttime, flags shall be retroreflectorized red.

Section 6E.04  Flagger Procedures

Support:

The use of paddles and flags by flaggers is illustrated in Figure 6E-1.
**Figure 6E-1. Use of Hand-Signaling Devices by Flaggers**

**PREFERRED METHOD**

STOP/SLOW Paddle

450 mm (18 in)

MIN.

**EMERGENCY SITUATIONS ONLY**

Red Flag

900 mm (36 in)

600 mm (24 in)

600 mm (24 in)

TO STOP TRAFFIC

TO LET TRAFFIC PROCEED

TO ALERT AND SLOW TRAFFIC

OMUTCD - English units are preferred.
Standard:
The following methods of signaling with paddles shall be used:
A. To stop road users, the flagger shall face road users and aim the STOP paddle face toward road users in a stationary position with the arm extended horizontally away from the body. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.
B. To direct stopped road users to proceed, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body. The flagger shall motion with the free hand for road users to proceed.
C. To alert or slow traffic, the flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body.
Option:
To further alert or slow traffic, the flagger holding the SLOW paddle face toward road users may motion up and down with the free hand, palm down.

Standard:
The following methods of signaling with a flag shall be used:
A. To stop road users, the flagger shall face road users and extend the flag staff horizontally across the road users’ lane in a stationary position so that the full area of the flag is visibly hanging below the staff. The free arm shall be held with the palm of the hand above the shoulder level toward approaching traffic.
B. To direct stopped road users to proceed, the flagger shall stand parallel to the road user movement and with flag and arm lowered from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.
C. To alert or slow traffic, the flagger shall face road users and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down without raising the arm above a horizontal position. The flagger shall keep the free hand down.

Section 6E.05 Flagger Stations
Standard:
Flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point.
Option:
The distances shown in Table 6E-1, which provides information regarding the stopping sight distance as a function of speed, may be used for the location of a flagger station. These distances may be increased for downgrades and other conditions that affect stopping distance.
Guidance:
Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space.
Standard:
Except in emergency situations, flagger stations shall be preceded by an advance warning sign or signs. Except in emergency situations, flagger stations shall be illuminated at night.
Guidance:

The flagger should stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users. A flagger should only stand in the lane being used by moving road users after road users have stopped. The flagger should be clearly visible to the first approaching road user at all times. The flagger also should be visible to other road users. The flagger should be stationed sufficiently in advance of the workers to warn them (for example, with audible warning devices such as horns or whistles) of approaching danger by out-of-control vehicles. The flagger should stand alone, never permitting a group of workers to congregate around the flagger station.

Option:

At a spot constriction, the flagger may have to take a position on the shoulder opposite the closed section in order to operate effectively.

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

---

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

<table>
<thead>
<tr>
<th>Speed * (km/h)</th>
<th>Distance (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>35</td>
</tr>
<tr>
<td>40</td>
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<td>70</td>
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<td>90</td>
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<td>100</td>
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<tr>
<td>110</td>
<td>220</td>
</tr>
<tr>
<td>120</td>
<td>250</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed * (mph)</th>
<th>Distance (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>115</td>
</tr>
<tr>
<td>25</td>
<td>155</td>
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<tr>
<td>30</td>
<td>200</td>
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<td>35</td>
<td>250</td>
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<tr>
<td>40</td>
<td>305</td>
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<tr>
<td>45</td>
<td>360</td>
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<tr>
<td>50</td>
<td>425</td>
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<td>55</td>
<td>495</td>
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<td>60</td>
<td>570</td>
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<tr>
<td>65</td>
<td>645</td>
</tr>
<tr>
<td>70</td>
<td>730</td>
</tr>
<tr>
<td>75</td>
<td>820</td>
</tr>
</tbody>
</table>

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed
Intentionally blank.
CHAPTER 6F. TEMPORARY TRAFFIC CONTROL ZONE DEVICES

Section 6F.01 Types of Devices

Support:
Whenever the acronym “TTC” is used in this Chapter, it refers to “temporary traffic control.”

Standard:
The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

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

Support:
FHWA policy requires that all roadside appurtenances such as traffic barriers, barrier terminals and crash cushions, bridge railings, sign and light pole supports, and work zone hardware used on the National Highway System meet the crashworthy performance criteria contained in the National Cooperative Highway Research Program (NCHRP) Report 350, “Recommended Procedures for the Safety Performance Evaluation of Highway Features.” The NCHRP 350 safety criteria also applies to the use of such roadside appurtenances used on ODOT-maintained highways. The website maintained by FHWA at http://safety.fhwa.dot.gov/programs/roadside_hardware.htm identifies all such hardware and includes copies of FHWA acceptance letters for each of them. In the case of proprietary items, links are provided to manufacturers’ websites as a source of detailed information on specific devices. The website also contains an “Ask the Experts” section where questions on roadside design issues can be addressed.

Local agencies might also have expanded the NCHRP Report 350 crashworthy criteria to apply to other highways in addition to the National Highway System.

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

As stated in Definition 17 in Section 1A.13, “crashworthy” is a characteristic of a roadside appurtenance that has been successfully crash tested in accordance with a national standard such as the National Cooperative Highway Research Program Report 350, “Recommended Procedures for the Safety Performance Evaluation of Highway Features.”

Standard:
As noted in the Preface and Section 1A.13, traffic control devices shall be defined as all flaggers, signs, signals, markings, and devices placed or erected by authority of a public body or official having jurisdiction, for the purpose of regulating, warning, or guiding traffic, including signs denoting names of streets and highways (see Section 1A.13).

All traffic control devices used on street and highway construction, maintenance, utility, or incident management operations shall conform to the applicable provisions of this Manual.

Section 6F.02 General Characteristics of Signs

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

See Part 2 for more information regarding sign uniformity.
Standard:

The colors for regulatory signs shall follow the Standards for regulatory signs in Table 2A-5 and Chapter 2B. Warning signs in TTC zones shall have a black legend and border on an orange background, except for the Highway-Rail Grade Crossing Advance Warning (W10-1) sign which shall have a black legend and border on a yellow background, and except for signs that are permitted in Part 2 or 7 to have fluorescent yellow-green backgrounds. Colors for guide signs shall follow the Standards in Table 2A-5 and Chapter 2D, except for guide signs as noted in Section 6F. 50.

Option:

Where the color orange is required, fluorescent red-orange or fluorescent yellow-orange colors may also be used.

Support:

The fluorescent versions of orange provide higher conspicuity than standard orange, especially during twilight.

Warning and guide signs used for TTC incident management situations (see Chapter 6I) may have a black legend and border on a fluorescent pink background.

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

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

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

Standard:

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

The sizes for TTC signs shall be as shown in Table 6F-1.

Option:

The dimensions of signs shown in Table 6F-1 may be increased wherever necessary for greater legibility or emphasis, such as on freeways and expressways.

Standard:

Deviations from standard sizes as prescribed herein shall be in 150 mm (6 in) increments.

Support:

Sign design details are contained in the “Sign Design Manual” (SDM) (see Section 1A.11).

Standard:

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

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

Option:

Sign illumination may be either internal or external.

Signs may be made of rigid or flexible material.
Section 6F.03  Sign Placement

Guidance:

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

Option:

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

Support:

The Provisions of this section regarding mounting height apply unless specifically stated otherwise for a particular sign elsewhere in this Manual.

Guidelines for height and lateral clearance of temporary ground-mounted signs are shown in Figure 6F-1.

Standard:

Ground-mounted signs installed at the side of the road in rural areas shall be mounted at a height at least 1.5 m (5 ft), measured from the bottom of the sign to the near edge of the pavement. In business, commercial, and residential districts where parking and/or bicycle or pedestrian movement is likely to occur, or where there are other obstructions to view, the distance between the bottom of the sign and the top of the near edge of the traveled way shall be at least 2.1 m (7 ft).

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

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

Guidance:

Neither portable nor permanent sign supports should be located on sidewalks, bicycle facilities, or areas designated for pedestrian or bicycle traffic. Signs mounted lower than 2.1 m (7 ft) should not project more than 100 mm (4 in) into pedestrian facilities.

Option:

A 2.1 m (7 ft) mounting height may be used in rural areas for increased visibility.

The height to the bottom of a secondary sign mounted below another sign may be 0.3 m (1 ft) less than the appropriate height specified above.

Guidance:

Except as noted in the Option, signs mounted on portable supports should not be used for a duration of more than 3 days.

Regulatory or guide signs mounted on fixed or movable Type III barricades should be mounted so that the center of the sign is at or above the height of the top of the barricade. Other signs mounted on movable Type III barricades should be mounted below the top rail so that the top of the sign is in line with the top of the barricades. Guide signs, although ordinarily erected on posts, may also be mounted above barricades, but shall not interfere with the effectiveness of necessary regulatory and warning signs.

Option:

The R9-8 through R9-11a series, R11 series, W1-6 through W1-8 series, M4-10, E5-1, or other similar type signs (see Figures 6F-3, 6F-4, and 6F-5) may be used on portable supports for longer than 3 days.

Support:

Methods of mounting signs other than on posts are illustrated in Figure 6F-2.
# Table 6F-1. Sizes of Temporary Traffic Control Signs

(Sheet 1 of 5)

<table>
<thead>
<tr>
<th>Sign</th>
<th>Code No.</th>
<th>Conventional Road</th>
<th>Expressway</th>
<th>Freeway</th>
<th>Minimum</th>
<th>Oversized</th>
</tr>
</thead>
<tbody>
<tr>
<td>STOP</td>
<td>R1-1</td>
<td>750 x 750 (30 x 30)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>YIELD</td>
<td>R1-2</td>
<td>900 x 900 (36 x 36 x 36)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>TO ONCOMING TRAFFIC</td>
<td>R1-2a</td>
<td>1200 x 600 (48 x 24)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Speed Limit</td>
<td>R2-1</td>
<td>600 x 750 (24 x 30)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>VEHICLES OVER 4 TONS</td>
<td>R2-H2a</td>
<td>—</td>
<td>900 x 1200 (36 x 48)</td>
<td>—</td>
<td>1200 x 1500 (48 x 60)</td>
<td>—</td>
</tr>
<tr>
<td>SPEED LIMIT 65 VEHICLES OVER ...</td>
<td>R2-H2b</td>
<td>—</td>
<td>900 x 1800 (36 x 72)</td>
<td>—</td>
<td>1200 x 2400 (48 x 96)</td>
<td>—</td>
</tr>
<tr>
<td>Turn Prohibition</td>
<td>R3-1, 2, 3, 4, 18</td>
<td>600 x 600 (24 x 24)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Mandatory Movement (1 lane)</td>
<td>R3-5</td>
<td>750 x 900 (30 x 36)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Optional Movement (1 lane)</td>
<td>R3-6</td>
<td>750 x 900 (30 x 36)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Mandatory Movement (text)</td>
<td>R3-7</td>
<td>750 x 750 (30 x 30)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Lane Use (2 lanes)</td>
<td>R3-8</td>
<td>750 x 750 (30 x 30)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>DO NOT PASS</td>
<td>R4-1</td>
<td>600 x 750 (24 x 30)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>PASS WITH CARE</td>
<td>R4-2</td>
<td>600 x 750 (24 x 30)</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Keep Right</td>
<td>R4-7</td>
<td>600 x 750 (24 x 30)</td>
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<tr>
<td>STAY IN LANE</td>
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<td>600 x 750 (24 x 30)</td>
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<tr>
<td>DO NOT ENTER</td>
<td>R5-1</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>WRONG WAY</td>
<td>R5-1a</td>
<td>900 x 600 (36 x 24)</td>
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<tr>
<td>ONE WAY (inside arrow)</td>
<td>R6-1</td>
<td>900 x 300 (36 x 12)</td>
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<tr>
<td>ONE WAY (with arrow)</td>
<td>R6-2</td>
<td>450 x 600 (18 x 24)</td>
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<tr>
<td>No Parking (symbol)</td>
<td>R8-3a</td>
<td>600 x 600 (24 x 24)</td>
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<td>Pedestrian Crosswalk</td>
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<td>SIDEWALK CLOSED</td>
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<tr>
<td>SIDEWALK CLOSED USE OTHER SIDE</td>
<td>R9-10</td>
<td>600 x 300 (24 x 12)</td>
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<td>SIDEWALK CLOSED AHEAD CROSS HERE</td>
<td>R9-11</td>
<td>600 x 300 (24 x 12)</td>
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<td>SIDEWALK CLOSED CROSS HERE</td>
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<td>ROAD CLOSED</td>
<td>R11-2</td>
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<td>ROAD CLOSED – LOCAL TRAFFIC ONLY</td>
<td>R11-3a, 4</td>
<td>1500 x 750 (60 x 30)</td>
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<td>Sign</td>
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<tr>
<td>Work Zone Increased Penalties</td>
<td>R11-H5a</td>
<td>600 x 1200 (24 x 48)</td>
<td>1200 X 2400 (48 x 96)</td>
<td>1200 X 2400 (48 x 96)</td>
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<tr>
<td>Weight Limit</td>
<td>R12-1, 2</td>
<td>600 x 750 (24 x 30)</td>
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<td>Weight Limit (with symbols)</td>
<td>R12-5</td>
<td>750 x 1050 (30 x 42)</td>
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<tr>
<td>Turn and Curve Signs</td>
<td>W1-1, 2, 3, 4</td>
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<td>Reverse Curve (2 or more lanes)</td>
<td>W1-4b, 4c</td>
<td>900 x 900 (36 x 36)</td>
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<td>One-Direction Large Arrow</td>
<td>W1-6</td>
<td>1200 x 600 (48 x 24)</td>
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<tr>
<td>Chevron</td>
<td>W1-8</td>
<td>900 x 1200 (36 x 48)</td>
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<tr>
<td>Construction Arrow</td>
<td>W1-H11</td>
<td>750 x 750 (30 x 30)</td>
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<td>Stop Ahead (symbol)</td>
<td>W3-1</td>
<td>900 x 900 (36 x 36)</td>
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<td>Yield Ahead (symbol)</td>
<td>W3-2</td>
<td>900 x 900 (36 x 36)</td>
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<td>Signal Ahead (symbol)</td>
<td>W3-3</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>BE PREPARED TO STOP</td>
<td>W3-4</td>
<td>900 x 900 (36 x 36)</td>
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<td>Speed Limit XX Ahead (symbol)</td>
<td>W3-5</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>Reduced Speed Zone Ahead</td>
<td>W3-5a</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>Merging Traffic</td>
<td>W4-1, 5</td>
<td>900 x 900 (36 x 36)</td>
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<td>Lane Ends (symbol)</td>
<td>W4-2</td>
<td>900 x 900 (36 x 36)</td>
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<td>Added Lane</td>
<td>W4-3, 6</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>THRU TRAFFIC MERGE LEFT</td>
<td>W4-7</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>ROAD NARROWS</td>
<td>W5-1</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>NARROW BRIDGE</td>
<td>W5-2</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>ONE LANE BRIDGE</td>
<td>W5-3</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>RAMP NARROWS</td>
<td>W5-4</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>Divided Highway (symbol)</td>
<td>W6-1</td>
<td>900 x 900 (36 x 36)</td>
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### Table 6F-1. Sizes of Temporary Traffic Control Signs (Sheet 3 of 5)

<table>
<thead>
<tr>
<th>Sign</th>
<th>Code No.</th>
<th>Conventional Road</th>
<th>Expressway</th>
<th>Freeway</th>
<th>Minimum</th>
<th>Oversized</th>
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<tr>
<td>Divided Highway Ends (symbol)</td>
<td>W6-2</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>Two-Way Traffic</td>
<td>W6-3</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>TWO-WAY TRAFFIC (plaque)</td>
<td>W6-4</td>
<td>300 x 450 (12 x 18)</td>
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<tr>
<td>Hill (symbol)</td>
<td>W7-1</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>BUMP</td>
<td>W8-1</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>DIP</td>
<td>W8-2</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>PAVEMENT ENDS</td>
<td>W8-3</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>SOFT SHOULDER</td>
<td>W8-4</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>Slippery When Wet (symbol)</td>
<td>W8-5</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>TRUCK CROSSING</td>
<td>W8-6</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>LOOSE GRAVEL</td>
<td>W8-7</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>ROUGH ROAD</td>
<td>W8-8</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>LOW SHOULDER</td>
<td>W8-9</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>SHOULDER DROP-OFF</td>
<td>W8-9a</td>
<td>750 x 750 (30 x 30)</td>
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<tr>
<td>UNEVEN LANES</td>
<td>W8-11</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>NO CENTER LINE</td>
<td>W8-H12</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>NO EDGE LINE</td>
<td>W8-H12a</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>Lane Ends</td>
<td>W9-1, 2</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>LANE CLOSED AHEAD</td>
<td>W9-3</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>Center Lane Closed Ahead (symbol)</td>
<td>W9-3a</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>Railroad Advance Warning (circular)</td>
<td>W10-1</td>
<td>900 dia. (36 dia.)</td>
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<tr>
<td>Truck (symbol)</td>
<td>W11-10</td>
<td>750 x 750 (30 x 30)</td>
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OMUTCD - English units are preferred.
### Table 6F-1. Sizes of Temporary Traffic Control Signs (Sheet 4 of 5)

<table>
<thead>
<tr>
<th>Sign</th>
<th>Code No.</th>
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<th>Expressway</th>
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<tr>
<td>Two Arrow</td>
<td>W12-1</td>
<td>600 x 600 (24 x 24)</td>
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<td>Low Clearance</td>
<td>W12-2</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>Advisory Speed (plaque)</td>
<td>W13-1</td>
<td>450 x 450 or 600 x 600 (18 x 18 or 24 x 24)</td>
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<tr>
<td>ON RAMP (plaque)</td>
<td>W13-4</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>NO PASSING ZONE (pennant)</td>
<td>W14-3</td>
<td>900x1200 x1200 (36 x 48 x 48)</td>
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<td>XX FEET (plaque)</td>
<td>W16-2</td>
<td>600 x 450 (24 x 18)</td>
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<td>Road Work (with distance)</td>
<td>W20-1</td>
<td>900 x 900 (36 x 36)</td>
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<tr>
<td>Detour (with distance)</td>
<td>W20-2</td>
<td>900 x 900 (36 x 36)</td>
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<td>Road (Street) Closed (with distance)</td>
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<td>900 x 900 (36 x 36)</td>
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<tr>
<td>One Lane Road (with distance)</td>
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<td>Lane(s) Closed (with distance)</td>
<td>W20-5, 5a</td>
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<td>Flagger (symbol)</td>
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<tr>
<td>WORKERS</td>
<td>W21-1</td>
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<tr>
<td>Workers (symbol)</td>
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<td>900 x 900 (36 x 36)</td>
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<td>FRESH OIL (TAR)</td>
<td>W21-2</td>
<td>750 x 750 (30 x 30)</td>
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<td>ROAD MACHINERY AHEAD</td>
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<td>SHOULDER WORK</td>
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<td>SHOULDER CLOSED (with distance)</td>
<td>W21-5b</td>
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<td>SURVEY CREW</td>
<td>W21-6</td>
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<td>UTILITY WORK AHEAD</td>
<td>W21-7</td>
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<td>BLASTING ZONE AHEAD</td>
<td>W22-1</td>
<td>1200 x 1200 (48 x 48)</td>
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<tr>
<td>TURN OFF 2-WAY RADIO AND CELL PHONE</td>
<td>W22-2</td>
<td>1050 x 900 (42 x 36)</td>
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### Table 6F-1. Sizes of Temporary Traffic Control Signs (Sheet 5 of 5)

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<tr>
<td>END BLASTING ZONE</td>
<td>W22-3</td>
<td>1050 x 900</td>
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<td>SLOW TRAFFIC AHEAD</td>
<td>W23-1</td>
<td>1200 x 600</td>
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<td>Double Reverse Curve (1 lane)</td>
<td>W24-1</td>
<td>900 x 900</td>
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<tr>
<td>Double Reverse Curve (2 lanes)</td>
<td>W24-1a</td>
<td>900 x 900</td>
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<tr>
<td>Double Reverse Curve (3 lanes)</td>
<td>W24-1b</td>
<td>900 x 900</td>
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<tr>
<td>ROAD WORK NEXT XX MILES</td>
<td>G20-1</td>
<td>900 x 450</td>
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<td>END ROAD WORK</td>
<td>G20-2</td>
<td>900 x 450</td>
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<tr>
<td>PILOT CAR FOLLOW ME</td>
<td>G20-4</td>
<td>900 x 450</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>EXIT OPEN</td>
<td>E5-2</td>
<td>1200 x 900</td>
<td>1200 x 900</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>EXIT CLOSED</td>
<td>E5-2a</td>
<td>1200 x 900</td>
<td>1200 x 900</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>EXIT OPEN AHEAD</td>
<td>E5-H2b</td>
<td>1200 x 1200</td>
<td>1200 x 1200</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>EXIT CLOSED AHEAD</td>
<td>E5-H2c</td>
<td>1200 x 1200</td>
<td>1200 x 1200</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>EXIT ONLY</td>
<td>E5-3</td>
<td>1200 x 900</td>
<td>1200 x 900</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>DETOUR (plaque)</td>
<td>M4-8</td>
<td>600 x 300</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>END DETOUR</td>
<td>M4-8a</td>
<td>600 x 450</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>END (plaque)</td>
<td>M4-8b</td>
<td>600 x 300</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>DETOUR (with arrow)</td>
<td>M4-9</td>
<td>750 x 600</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Bike/Pedestrian Detour (with arrow)</td>
<td>M4-9a</td>
<td>750 x 600</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>PEDESTRIAN DETOUR (with arrow)</td>
<td>M4-9b</td>
<td>750 x 600</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>BIKE DETOUR (with arrow)</td>
<td>M4-9c</td>
<td>750 x 600</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Detour (inside arrow)</td>
<td>M4-10</td>
<td>1200 x 450</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

**Notes:**

1. Larger signs may be used wherever necessary for greater legibility or emphasis.
2. Dimensions are shown in millimeters followed by inches in parentheses and are shown as width x height.
3. For freeways and expressways, the size of diamond shaped TTC warning signs shall be a minimum of 1200 x 1200 mm (48 x 48 in).

OMUTCD - English units are preferred.
Figure 6F-1. Height and Lateral Location of Signs—Typical Installations

**RURAL DISTRICT**

- **ROAD WORK AHEAD**
  - 1.8 to 3.7 m (6 to 12 ft)
  - Not less than 1.5 m (5 ft)

- **DETOUR 500 FT**
  - 1.8 to 3.7 m (6 to 12 ft)
  - Not less than 1.8 m (6 ft)
  - Not less than 1.2 m (4 ft)

**URBAN DISTRICT**

- **ROAD CLOSED 500 FT**
  - Not less than 0.6 m (2 ft)
  - Not less than 2.1 m (7 ft)

- **RIGHT LANE CLOSED 1000 FT**
  - Not less than 0.6 m (2 ft)
  - Not less than 2.1 m (7 ft)

---

OMUTCD - English units are preferred.
Figure 6F-2. Methods of Mounting Signs Other Than on Posts

PORTABLE AND TEMPORARY MOUNTINGS

High-Level Warning Device (Flag Tree)

Orange Flag (optional)

0.3 m (1 ft) MIN. above the traveled way

2.4 m (8 ft) minimum (see Section 6F.57)

BARRICADES

Note: Examples only, see NCHRP Report 350 regarding crashworthy designs.

OMUTCD - English units are preferred.
Guidance:

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

**Standard:**

Sign supports shall be crashworthy. Large signs having an area exceeding 5 square meters (50 square feet) that are installed on multiple breakaway posts shall be mounted a minimum of 2.1 m (7 ft) above the ground.

Signs mounted on barricades, or other portable supports, shall be no less than 0.3 m (1 ft) above the traveled way.

**Option:**

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

Guidance:

Unshielded sign posts placed in the clear zone should yield or breakaway upon impact to minimize obstructions to road users.

**Support:**

If alterations are made to specific traffic control device supports that have been successfully crash tested in accordance with NCHRP Report 350, the altered supports might not be considered to be crashworthy.

**Section 6F.04  Sign Maintenance**

**Standard:**

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

Signs that have lost significant legibility shall be promptly replaced.

**Section 6F.05  Regulatory Sign Authority**

**Support:**

Regulatory signs such as those shown in Figure 6F-3 and Appendix C inform road users of traffic laws or regulations and indicate the applicability of legal requirements that would not otherwise be apparent.

**Standard:**

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

**Section 6F.06  Regulatory Sign Design**

**Standard:**

TTC regulatory signs shall conform to the Standards for regulatory signs presented in Part 2 and the "Sign Design Manual" (SDM) (see Section 1A.11).

**Support:**

Regulatory signs are generally rectangular with a black legend and border on a white background. Exceptions include the STOP, YIELD, DO NOT ENTER, WRONG WAY, and ONE WAY signs.

**Option:**

The ONE WAY sign may be either a horizontal or vertical rectangular sign.
Figure 6F-3. Regulatory Signs in Temporary Traffic Control Zones
(Sheet 1 of 2)

OMUTCD - English units are preferred.
Section 6F.07  Regulatory Sign Applications

Standard:

If a TTC zone requires regulatory measures different from those existing, the existing permanent regulatory devices shall be removed or covered and superseded by the appropriate temporary regulatory signs. This change shall be made in conformance with applicable ordinances or statutes of the jurisdiction.

Section 6F.08  ROAD (STREET) CLOSED Sign (R11-2)

Guidance:

The ROAD (STREET) CLOSED (R11-2) sign (see Figure 6F-3, Sheet 2 of 2) should be used when the roadway is closed to all road users except contractors’ equipment or officially authorized vehicles. The R11-2 sign should be accompanied by appropriate warning and detour signing.

Option:

The words BRIDGE OUT (or BRIDGE CLOSED) may be substituted for ROAD (STREET) CLOSED where applicable.

Guidance:

The ROAD (STREET) CLOSED sign should be installed at or near the center of the roadway on or above a Type III barricade that closes the roadway (see Section 6F.63).
Standard:

The ROAD (STREET) CLOSED sign shall not be used where road user flow is maintained or where the actual closure is some distance beyond the sign.

Section 6F.09  Local Traffic Only Signs (R11-3a, R11-3b, R11-4, R11-H5)

Guidance:

The Local Traffic Only signs (see Figure 6F-3, Sheet 2 of 2) should be used where road user flow detours to avoid a closure some distance beyond the sign, but where local road users can use the roadway to the point of closure. These signs should be accompanied by appropriate warning and detour signing.

In rural applications, the Local Traffic Only sign should have the legend ROAD CLOSED XX MILES AHEAD, LOCAL TRAFFIC ONLY (R11-3a).

The ROUTE CLOSED (R11-H5) sign should be used when the road on which it is used in not closed but the route, on another road, is closed. When used, the ROUTE CLOSED sign shall have attached to it a Route Marker (M1) sign.

Option:

In urban areas, the legend ROAD (STREET) CLOSED TO THRU TRAFFIC (R11-4) or ROAD CLOSED, LOCAL TRAFFIC ONLY may be used.

The words BRIDGE OUT (or BRIDGE CLOSED) may be substituted for the words ROAD (STREET) CLOSED on the R11-3a or R11-4 sign where applicable (see R11-3b in Appendix C).

Section 6F.10  Weight Limit Signs (R12-1, R12-2, R12-5)

Standard:

A Weight Limit sign (see Figure 6F-3, Sheet 2 of 2), which shows the gross weight or axle weight that is permitted on the roadway or bridge, shall be consistent with State or local regulations and shall not be installed without the approval of the authority having jurisdiction over the highway.

When weight restrictions are imposed because of the activity in a TTC zone, a marked detour shall be provided for vehicles weighing more than the posted limit.

Section 6F.11  STAY IN LANE Sign (R4-9)

Option:

A STAY IN LANE (R4-9) sign (see Figure 6F-3, Sheet 1 of 2) may be used where a multi-lane shift has been incorporated as part of the TTC on a highway to direct road users around road work that occupies part of the roadway on a multi-lane highway.

Section 6F.12  PEDESTRIAN CROSSWALK Sign (R9-8)

Option:

The PEDESTRIAN CROSSWALK (R9-8) sign (see Figure 6F-3, Sheet 1 of 2) may be used to indicate where a temporary crosswalk has been established.

Standard:

If a temporary crosswalk is established, it shall be accessible to pedestrians with disabilities in accordance with Section 6D.02.
Section 6F.13 **SIDEWALK CLOSED Signs (R9-9, R9-10, R9-11, R9-11a)**

Guidance:

SIDEWALK CLOSED signs (see Figure 6F-3, Sheet 2 of 2) should be used where pedestrian flow is restricted. Bicycle/Pedestrian Detour (M4-9a) signs or Pedestrian Detour (M4-9b) signs should be used where pedestrian flow is rerouted (see Section 6F.53).

The SIDEWALK CLOSED (R9-9) sign should be installed at the beginning of the closed sidewalk, at the intersections preceding the closed sidewalk, and elsewhere along the closed sidewalk as needed.

The SIDEWALK CLOSED, (ARROW) USE OTHER SIDE (R9-10) sign should be installed at the beginning of the restricted sidewalk when a parallel sidewalk exists on the other side of the roadway.

The SIDEWALK CLOSED AHEAD, (ARROW) CROSS HERE (R9-11) sign should be used to indicate to pedestrians that sidewalks beyond the sign are closed and to direct them to open crosswalks, sidewalks, or other travel paths.

The SIDEWALK CLOSED, (ARROW) CROSS HERE (R9-11a) sign should be installed just beyond the point to which pedestrians are being redirected.

Support:

These signs are typically mounted on a detectable barricade to encourage compliance and to communicate with pedestrians that the sidewalk is closed. Printed signs are not useful to many pedestrians with visual disabilities. A barrier or barricade detectable by a person with a visual disability is sufficient to indicate that a sidewalk is closed. If the barrier is continuous with detectable channelizing devices for an alternate route, accessible signage might not be necessary. An audible information device is needed when the detectable barricade or barrier for an alternate channelized route is not continuous.

Section 6F.14 **Special Regulatory Signs**

Option:

Special regulatory signs may be used based on engineering judgment consistent with regulatory requirements.

Guidance:

Special regulatory signs should conform to the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.

Section 6F.14.1 **Work Zone Increased Penalties Sign (R11-H5a)**

Support:

O.R.C. Section 5501.27(A)(1) requires that the Director of Transportation “adopt rules governing the posting of signs advising motorists that increased penalties apply for certain traffic violations on streets or highways in a construction zone.” Also, O.R.C. Section 5501.27(A)(2) requires that the Director adopt “rules governing the posting of signs to be used pursuant to section 2903.081 of the Revised Code giving notice to motorists of the prohibitions set forth in sections 2903.06 and 2903.08 of the Revised Code regarding the death of or injury to any person in a construction zone as a proximate result of a reckless operation offense or speeding offense.”

Standard:

In accordance with O.R.C. Section 4511.98, the “director of transportation, board of county commissioners, or board of township trustees shall cause signs to be erected advising motorists that increased penalties apply for certain traffic violations occurring on streets or highways in a construction zone. The increased penalties shall be effective only when signs are erected in accordance with the guidelines and design specifications established by the director under section 5501.27 of the Revised Code, and when a violation occurs during hours of actual work within the construction zone.”

OMUTCD - English units are preferred.
The Work Zone Increased Penalties (R11-H5a) sign (see Appendix C) shall be used for this purpose.

Support:

The guidelines established by the Director are in Part 6 of the ODOT “Traffic Engineering Manual” (TEM) (see Section 1A.11) and in Chapter 5501:2-10 of the Ohio Administrative Code (OAC). Administrative Code Section 5501:2-10-02 also requires that each agency adopt procedures pertaining to requiring a contractor, work crew, or utility to erect, maintain, and remove signs, in conformance with these guidelines.

Section 6F.15   Warning Sign Function, Design, and Application

Support:

TTC zone warning signs (see Figure 6F-4 and Appendix C) notify road users of specific situations or conditions on or adjacent to a roadway that might not otherwise be apparent.

Standard:

TTC warning signs shall conform to the Standards for warning signs presented in Part 2 and in the “Sign Design Manual” (SDM) (see Section 1A.11). Except as noted in the Option below, TTC warning signs shall be diamond-shaped with a black legend and border on an orange background, except for the W10-1 sign which shall have a black legend and border on a yellow background, and except for signs that are permitted in Part 2 or 7 to have fluorescent yellow-green backgrounds.

Option:

Warning signs used for TTC incident management situations may have a black legend and border on a fluorescent pink background.

Mounting or space considerations may justify a change from the standard diamond shape.

In emergencies, available warning signs having yellow backgrounds may be used if signs with orange or fluorescent pink backgrounds are not at hand.

Guidance:

Where roadway or road user conditions require greater emphasis, larger than standard size warning signs should be used, with the legend enlarged approximately in proportion to the outside dimensions.

Where any part of the roadway is obstructed or closed by work activities or incidents, advance warning signs should be installed to alert road users well in advance of these obstructions or restrictions.

Where road users include pedestrians, the provision of supplemental audible information or detectable barriers or barricades should be considered for people with visual disabilities.

Support:

Detectable barriers or barricades communicate very clearly to pedestrians who have visual disabilities that they can no longer proceed in the direction that they are traveling.

Option:

Advance warning signs may be used singly or in combination.

Standard:

Because of their importance, advance warning signs for higher-speed locations shall have a size of 1200 x 1200 mm (48 x 48 in) (see Part 2).

For freeways and expressways, the size of diamond shaped TTC warning signs shall be a minimum of 1200 x 1200 mm (48 x 48 in).
Option:

Where speeds and volumes are moderately low, a minimum size of 900 x 900 mm (36 x 36 in) may be used for advance warning signs.

On secondary roads or City streets where speeds are very low, signs smaller than the standard size, but not less than 600 x 600 mm (24 x 24 in), may be used for warning signs having short word messages or clear symbols.

Advance warning signs larger than the minimum standards may be used for additional emphasis of the TTC zone (see Part 2).

Where distances are not shown on warning signs as part of the message, a supplemental plaque with the distance legend may be mounted immediately below the sign on the same support.

Section 6F.16 Position of Advance Warning Signs

Guidance:

As shown in Figure 6C-1, where highway conditions permit, warning signs in TTC zones should be placed in advance of the transition area at varying distances depending on roadway type, condition, and posted speed. Table 6C-1 contains information regarding the spacing of advance warning signs. Where a series of two or more advance warning signs is used, the closest sign to the transition area should be placed approximately 30 m (100 ft) for low-speed urban streets to 300 m (1,000 ft) or more for freeways and expressways.

Support:

Various conditions, such as limited sight distance or obstructions that might require a driver to reduce speed or stop, might require additional advance warning signs.

Option:

As an alternative to a specific distance on advance warning signs, the word AHEAD may be used.

Support:

At TTC zones on lightly-traveled roads, all of the advance warning signs prescribed for major construction might not be needed.

Option:

Utility work, maintenance, or minor construction can occur within the TTC zone limits of a major construction project, and additional warning signs may be needed.

Guidance:

Utility, maintenance, and minor construction signing and TTC should be coordinated with appropriate authorities so that road users are not confused or misled by the additional TTC devices.

Section 6F.17 ROAD (STREET) WORK Sign (W20-1)

Guidance:

The ROAD (STREET) WORK (W20-1) sign (see Figure 6F-4, Sheet 3 of 4), which serves as a general warning of obstructions or restrictions, should be located in advance of the work space or any detour, on the road where the work is taking place.

Where traffic can enter a TTC zone from a crossroad or a major (high-volume) driveway, an advance warning sign should be used on the crossroad or major driveway.

Standard:

The ROAD (STREET) WORK (W20-1) sign shall have the legend ROAD (STREET) WORK, XX FT, XX MILES, or AHEAD.
Figure 6F-4. Warning Signs in Temporary Traffic Control Zones
(Sheet 1 of 4)
Figure 6F-4. Warning Signs in Temporary Traffic Control Zones
(Sheet 2 of 4)
Figure 6F-4. Warning Signs in Temporary Traffic Control Zones  
(Sheet 3 of 4)

* These signs are shown in Appendix C and in the “Sign Design Manual” (SDM) with the optional AHEAD legend for the last line of the message. Also, an optional STREET CLOSED word message sign is shown in the SDM for the W20-3.
Section 6F.18  DETOUR Sign (W20-2)
Guidance:

The DETOUR (W20-2) sign (see Figure 6F-4, Sheet 3 of 4) should be used in advance of a road user detour over a different roadway or route.

Standard:

The DETOUR sign shall have the legend DETOUR, XX FT, XX MILES, or AHEAD.

Section 6F.19  ROAD (STREET) CLOSED Sign (W20-3)
Guidance:

The ROAD (STREET) CLOSED (W20-3) sign (see Figure 6F-4, Sheet 3 of 4) should be used in advance of the point where a highway is closed to all road users, or to all but local road users.

Standard:

The ROAD (STREET) CLOSED sign shall have the legend ROAD (STREET) CLOSED, XX FT, XX MILES, or AHEAD.
Section 6F.20  **ONE LANE ROAD Sign (W20-4)**

**Standard:**

The ONE LANE ROAD (W20-4) sign (see Figure 6F-4, Sheet 3 of 4) shall be used only in advance of that point where vehicular traffic in both directions must use a common single lane (see Section 6C.10). It shall have the legend ONE LANE ROAD, XX FT, XX MILES, or AHEAD.

Section 6F.21  **Lane(s) Closed Signs (W20-5, W20-5a)**

**Standard:**

The Lane(s) Closed sign (see Figure 6F-4, Sheet 3 of 4) shall be used in advance of that point where one or more through lanes of a multi-lane roadway are closed.

For a single lane closure, the Lane Closed (W20-5) sign (see Figure 6F-4, Sheet 3 of 4) shall have the legend RIGHT (LEFT) LANE CLOSED, XX FT, XX MILES, or AHEAD. Where two adjacent lanes are closed, the W20-5a sign (see Figure 6F-4, Sheet 3 of 4) shall have the legend RIGHT (LEFT) TWO LANES CLOSED, XX FT, XX MILES, or AHEAD.

Section 6F.22  **CENTER LANE CLOSED AHEAD Signs (W9-3, W9-3a)**

**Guidance:**

The CENTER LANE CLOSED AHEAD (W9-3) sign (see Figure 6F-4, Sheet 2 of 4) should be used in advance of that point where work occupies the center lane(s) and approaching vehicular traffic is directed to the right or left of the work zone in the center lane.

**Option:**

The Center Lane Closed Ahead (W9-3a) symbol sign (see Figure 6H-38) may be substituted for the CENTER LANE CLOSED AHEAD (W9-3) word message sign.

Section 6F.23  **THRU TRAFFIC MERGE LEFT (RIGHT) Sign (W4-7)**

**Guidance:**

The THRU TRAFFIC MERGE LEFT (RIGHT) (W4-7) sign (see Figure 6F-4, Sheet 1 of 4) should be used in advance of an intersection where one or more lane closures on the far side of a multi-lane intersection require through vehicular traffic on the approach to the intersection to use the left (right) lane to proceed through the intersection.

Section 6F.24  **Lane Ends Sign (W4-2)**

**Option:**

The Lane Ends (W4-2) symbol sign (see Figure 6F-4, Sheet 1 of 4) may be used to warn drivers of the reduction in the number of lanes for moving vehicular traffic in the direction of travel on a multi-lane roadway.

Section 6F.25  **ON RAMP Plaque (W13-4)**

**Guidance:**

When work is being done on a ramp, but the ramp remains open, the ON RAMP (W13-4) plaque (see Figure 6F-4, Sheet 3 of 4) should be used to supplement the advance ROAD WORK sign.

Section 6F.26  **RAMP NARROWS Sign (W5-4)**

**Guidance:**

The RAMP NARROWS (W5-4) sign (see Figure 6F-4, Sheet 1 of 4) should be used in advance of the point where work on a ramp reduces the normal width of the ramp along a part or all of the ramp.
Section 6F.27  **SLOW TRAFFIC AHEAD Sign (W23-1)**

Option:

The SLOW TRAFFIC AHEAD (W23-1) sign (see Figure 6F-4, Sheet 4 of 4) may be used on a shadow vehicle, usually mounted on the rear of the most upstream shadow vehicle, along with other appropriate signs for mobile operations to warn of slow moving work vehicles. A ROAD WORK (W20-1) sign may also be used with the SLOW TRAFFIC AHEAD sign.

Section 6F.28  **EXIT OPEN, EXIT CLOSED (AHEAD), EXIT ONLY Signs (E5-2, E5-2a, E5-H2b, E5-H2c, E5-3)**

Option:

An EXIT OPEN (E5-2), EXIT CLOSED (E5-2a), or EXIT ONLY (E5-3) sign (see Figure 6F-5) may be used to supplement other warning signs where work is being conducted in the vicinity of an exit ramp and where the exit maneuver for vehicular traffic using the ramp is different from the normal condition. The EXIT OPEN AHEAD (E5-H2b) and the EXIT CLOSED AHEAD (E5-H2c) signs may also be used (see Appendix C).

Guidance:

When an exit ramp is closed, an EXIT CLOSED panel with a black legend and border on an orange background should be placed diagonally across the interchange/intersection guide signs.

Section 6F.29  **Flagger Sign (W20-7a, W20-7)**

Guidance:

The Flagger (20-7a) symbol sign (see Figure 6F-4, Sheet 3 of 4) should be used in advance of any point where a flagger is stationed to control road users.

Option:

A distance legend may be displayed on a supplemental plaque below the Flagger sign. The sign may be used with appropriate legends or in conjunction with other warning signs, such as the BE PREPARED TO STOP (W3-4) sign (see Figure 6F-4, Sheet 1 of 4).

The FLAGGER (W20-7) word message sign with distance legends may be substituted for the Flagger (W20-7a) symbol sign.

**Standard:**

The Flagger sign shall be removed, covered, or turned away from road users when the flagging operations are not occurring.

Section 6F.30  **Two-Way Traffic Sign (W6-3)**

Guidance:

When one roadway of a normally divided highway is closed, with two-way vehicular traffic maintained on the other roadway, the Two-Way Traffic (W6-3) sign (see Figure 6F-4, Sheet 2 of 4) should be used at the beginning of the two-way vehicular traffic section and at intervals to remind road users of opposing vehicular traffic.

Section 6F.31  **Workers Sign (W21-1, W21-1a)**

Option:

A Workers (W21-1a) symbol sign (see Figure 6F-4, Sheet 3 of 4) may be used to alert road users of workers in or near the roadway.
Guidance:

In the absence of other warning devices, a Workers symbol sign should be used when workers are in the roadway.

Option:

The WORKERS (W21-1) word message sign may be used as an alternate to the Workers (W21-1a) symbol sign.

Section 6F.32  FRESH OIL (TAR) Sign (W21-2)

Guidance:

The FRESH OIL (TAR) (W21-2) sign (see Figure 6F-4, Sheet 3 of 4) should be used to warn road users of the surface treatment.

Section 6F.33  ROAD MACHINERY AHEAD Sign (W21-3)

Option:

The ROAD MACHINERY AHEAD (W21-3) sign (see Figure 6F-4, Sheet 3 of 4) may be used to warn machinery operating in or adjacent to the roadway.

Section 6F.34  Motorized Traffic Signs (W8-6, W11-10)

Option:

Motorized Traffic (W8-6, W11-10) signs may be used to alert road users to locations where unexpected travel on the roadway or entries into or departures from the roadway by construction vehicles might occur. The TRUCK CROSSING (W8-6) word message sign may be used as an alternate to the Truck Crossing symbol (W11-10) sign (see Figure 6F-4, Sheet 2 of 4) where there is an established construction vehicle crossing of the roadway.

Support:

These locations might be relatively confined or might occur randomly over a segment of roadway.
Section 6F.35  Shoulder Work Signs (W21-5, W21-5a, W21-5b)

Support:

Shoulder Work signs (see Figure 6F-4, Sheets 3 and 4 of 4) warn of maintenance, reconstruction, or utility operations on the highway shoulder where the roadway is unobstructed.

Standard:

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

Option:

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

Guidance:

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

Section 6F.36  SURVEY CREW Sign (W21-6)

Guidance:

The SURVEY CREW (W21-6) sign (see Figure 6F-4, Sheet 4 of 4) should be used to warn of surveying crews working in or adjacent to the roadway.

Section 6F.37  UTILITY WORK Sign (W21-7)

Option:

The UTILITY WORK (W21-7) sign (see Figure 6F-4, Sheet 4 of 4) may be used as an alternate to the ROAD (STREET) WORK (W20-1) sign for utility operations on or adjacent to a highway.

Support:

Typical examples of where the UTILITY WORK sign is used appear in Figures 6H-4, 6H-6, 6H-10, 6H-15, 6H-18, 6H-21, 6H-22, 6H-26, and 6H-33.

Standard:

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

Section 6F.38  Signs for Blasting Areas

Support:

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

Standard:

Road users shall be warned to turn off mobile radio transmitters and cellular telephones where blasting operations occur. A sequence of signs shall be prominently displayed to direct operators of mobile radio equipment, including cellular telephones, to turn off transmitters in a blasting area. These signs shall be covered or removed when there are no explosives in the area or the area is otherwise secured.
Section 6F.39 **BLASTING ZONE AHEAD Sign (W22-1)**

**Standard:**

The BLASTING ZONE AHEAD (W22-1) sign (see Figure 6F-4, Sheet 4 of 4) shall be used in advance of any TTC zone where explosives are being used. The TURN OFF 2-WAY RADIO AND CELL PHONE and END BLASTING ZONE signs shall be used in sequence with this sign.

Section 6F.40 **TURN OFF 2-WAY RADIO AND CELL PHONE Sign (W22-2)**

**Standard:**

The TURN OFF 2-WAY RADIO AND CELL PHONE (W22-2) sign (see Figure 6F-4, Sheet 4 of 4) shall follow the BLASTING ZONE AHEAD sign and shall be placed at least 300 m (1,000 ft) before the beginning of the blasting zone.

Section 6F.41 **END BLASTING ZONE Sign (W22-3)**

**Standard:**

The END BLASTING ZONE (W22-3) sign (see Figure 6F-4, Sheet 4 of 4) shall be placed a minimum of 300 m (1,000 ft) past the blasting zone.

**Option:**

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

Section 6F.42 **Shoulder Signs (W8-4, W8-9, W8-9a)**

**Option:**

The SOFT SHOULDER (W8-4) sign (see Figure 6F-4, Sheet 2 of 4) may be used to warn of a soft shoulder condition.

The LOW SHOULDER (W8-9) sign (see Figure 6F-4, Sheet 2 of 4) may be used to warn of a shoulder condition where there is an elevation difference of less than 75 mm (3 in) between the shoulder and the travel lane.

**Guidance:**

The SHOULDER DROP OFF (W8-9a) sign (see Figure 6F-4, Sheet 2 of 4) should be used when a shoulder drop-off, adjacent to the travel lane, exceeds 75 mm (3 in) in depth for a continuous length along the roadway, based on engineering judgment.

Section 6F.43 **UNEVEN LANES Sign (W8-11)**

**Guidance:**

The UNEVEN LANES (W8-11) sign (see Figure 6F-4, Sheet 2 of 4) should be used during operations that create a difference in elevation between adjacent lanes that are open to travel.

Section 6F.44 **NO CENTER LINE and NO EDGE LINE Signs (W8-H12, W8-H12a)**

**Guidance:**

The NO CENTER LINE (W8-H12) sign (see Figure 6F-4, Sheet 2 of 4) or the NO EDGE LINE sign (W8-H12a) sign (see Appendix C) should be used as appropriate when the work obliterates the center or edge line pavement markings. The sign should be placed at the beginning of the TTC zone and repeated at 3.2 km (2 mi) intervals in long TTC zones.

**Support:**

See Section 6F.72 for information on temporary pavement markings.
Section 6F.45  Double Reverse Curve Signs (W24 Series)

Option:

The Double Reverse Curve (W24-1, W24-1a, or W24-1b) sign (see Figure 6F-4, Sheet 4 of 4) may be used when the tangent distance between two reverse curves is less than 180 m (600 ft), thus making it difficult for a second Reverse Curve (W1-4 Series) sign to be placed between the curves.

Standard:

If a Double Reverse Curve sign is used, the number of lanes illustrated on the sign shall be the same as the number of through lanes available to road users, and the direction of the double reverse curve shall be appropriately illustrated.

Section 6F.46  Other Warning Signs

Option:

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

Besides the warning signs specifically related to TTC zones, several other warning signs in Part 2 may apply in TTC zones (see Appendix C).

Standard:

Except as noted in Section 6F.02, other warning signs that are used in TTC zones shall have black legends and borders on an orange background.

Section 6F.46.1  Construction Arrow Sign (W1-H11)

Option:

This sign may be used to help guide traffic through TTC zones.

Standard:

The Construction Arrow (W1-H11) sign (see Appendix C) shall not be used in place of the standard symbol warning signs. The sign shall be mounted so that the arrow indicates either an oblique left or right movement.

Option:

The sign may be located on the left or right side of the traveled lane.

Support:

An example of a situation where this sign might be used would be a lane shift, such as those shown in Figures 6H-24, 6H-32 and 6H-36.

Section 6F.47  Special Warning Signs

Option:

Special warning signs may be used based on engineering judgment.

Guidance:

Special warning signs should conform to the general requirements of color, shape, and alphabet size and series. The sign message should be brief, legible, and clear.

Section 6F.48  Advisory Speed Plaque (W13-1)

Option:

In combination with a warning sign, an Advisory Speed (W13-1) plaque (see Figure 6F-4, Sheet 2 of 4) may be used to indicate a recommended safe speed through the TTC zone.
Standard:

The Advisory Speed plaque shall not be used in conjunction with any sign other than a warning sign, nor shall it be used alone. When used with orange TTC zone signs, this plaque shall have a black legend and border on an orange background. The sign shall be at least 600 x 600 mm (24 x 24 in) in size when used with a sign that is 900 x 900 mm (36 x 36 in) or larger. Except in emergencies, an Advisory Speed plaque shall not be mounted until the recommended speed is determined by the highway agency.

Section 6F.49 Supplementary Distance Plaque (W7-3a)

Option:

In combination with a warning sign, a Supplementary Distance (W7-3a) plaque with the legend NEXT XX MILE may be used to indicate the length of highway over which a work activity is being conducted, or over which a condition exists in the TTC zone.

In long TTC zones, Supplementary Distance plaques with the legend NEXT XX MILES may be placed in combination with warning signs at regular intervals within the zone to indicate the remaining length of highway over which the TTC work activity or condition exists.

Standard:

The Supplementary Distance plaque with the legend NEXT XX MILES shall not be used in conjunction with any sign other than a warning sign, nor shall it be used alone. When used with orange TTC zone signs, this plaque shall have a black legend and border on an orange background. The sign shall be at least 750 x 600 mm (30 x 24 in) in size when used with a sign that is 900 x 900 mm (36 x 36 in) or larger.

Guidance:

When used in TTC zones, the Supplementary Distance plaque with the legend NEXT XX MILES should be placed below the initial warning sign designating that, within the approaching zone, a temporary work activity or condition exists.

Section 6F.50 Guide Signs

Support:

Guide signs along highways provide road users with information to help them along their way through the TTC zone. The design of guide signs is presented in Part 2.

Guidance:

The following guide signs should be used in TTC zones as needed:

A. Standard route markings, where temporary route changes are necessary;
B. Directional signs and street name signs; and
C. Special guide signs relating to the condition or work being done.

Standard:

If additional temporary guide signs are used in TTC zones, they shall have a black legend and border on an orange background.

Option:

Guide signs used in TTC incident management situations may have a black legend and border on a fluorescent pink background.

When directional signs and street name signs are used in conjunction with detour routing, these signs may have a black legend and border on an orange background.
When permanent directional signs or permanent street name signs are used in conjunction with detour signing, they may have a white legend on a green background.

**Section 6F.51 ROAD WORK NEXT XX MILES Sign (G20-1)**

**Guidance:**

The ROAD WORK NEXT XX MILES (G20-1) sign (see Figure 6F-4, Sheet 3 of 4) should be installed in advance of TTC zones that are more than 3.2 km (2 mi) in length.

**Option:**

The ROAD WORK NEXT XX MILES sign may be mounted on a Type III barricade. The sign may also be used for TTC zones of shorter length.

**Standard:**

The distance shown on the ROAD WORK NEXT XX MILES sign shall be stated to the nearest whole mile.

**Section 6F.52 END ROAD WORK Sign (G20-2)**

**Guidance:**

When used, the END ROAD WORK (G20-2) sign (see Figure 6F-4, Sheet 3 of 4) should be placed near the end of the termination area, as determined by engineering judgment.

**Option:**

The END ROAD WORK sign may be installed on the back of a warning sign facing the opposite direction of road users or on the back of a Type III barricade.

**Section 6F.53 Detour Signs (M4-8, M4-8a, M4-8b, M4-9, M4-9a, M4-9b, M4-9c, M4-10)**

**Standard:**

Each detour shall be adequately marked with standard temporary route signs and destination signs.

**Option:**

Detour signs in TTC incident management situations may have a black legend and border on a fluorescent pink background.

The Detour Arrow (M4-10) sign (see Figure 6F-5) may be used where a detour route has been established.

The DETOUR (M4-8) sign (see Figure 6F-5) may be mounted at the top of a route sign assembly to mark a temporary route that detours from a highway, bypasses a section closed by a TTC zone, and rejoins the highway beyond the TTC zone.

**Guidance:**

The Detour Arrow (M4-10) sign should normally be mounted just below the ROAD CLOSED (R11-2, R11-3a, or R11-4) sign. The Detour Arrow sign should include a horizontal arrow pointed to the right or left as required.

The DETOUR (M4-9) sign (see Figure 6F-5) should be used for unnumbered highways, for emergency situations, for periods of short durations, or where, over relatively short distances, road users are guided along the detour and back to the desired highway without route signs.

A Street Name sign should be placed above, or the street name should be incorporated into, a DETOUR (M4-9) sign to indicate the name of the street being detoured.
Option:

The END DETOUR (M4-8a) or END (M4-8b) sign (see Figure 6F-5) may be used to indicate that the
detour has ended.

Guidance:

When the END DETOUR sign is used on a numbered highway, the sign should be mounted above a sign
after the end of the detour.

The Pedestrian/Bicycle Detour (M4-9a) sign (see Figure 6F-5) should be used where a
pedestrian/bicycle detour route has been established because of the closing of a pedestrian/bicycle facility to
through traffic.

Standard:

If used, the Pedestrian/Bicycle Detour sign shall have an arrow pointing in the appropriate
direction.

Option:

The arrow on a Pedestrian/Bicycle Detour sign may be on the sign face or on a supplemental plaque.

The Pedestrian Detour (M4-9b) sign or Bicycle Detour (M4-9c) sign (see Figure 6F-5) may be used
where a pedestrian or bicycle detour route (not both) has been established because of the closing of the
pedestrian or bicycle facility to through traffic.

Section 6F.54  PILOT CAR FOLLOW ME Sign (G20-4)

Standard:

The PILOT CAR FOLLOW ME (G20-4) sign (see Figure 6F-4, Sheet 4 of 4) shall be mounted in a
conspicuous position on the rear of a vehicle used for guiding one-way vehicular traffic through or
around a TTC zone. A flagger shall be stationed on the approach to the activity area to stop vehicular
traffic until the pilot vehicle is available.

Section 6F.55  Portable Changeable Message Signs

Standard:

Portable Changeable Message signs shall be TTC devices with the flexibility to display a variety of
messages. Each message shall consist of either one or two phases. A phase shall consist of up to three
lines of eight characters per line. Each character module shall use at least a five wide and seven high
pixel matrix.

Support:

Portable Changeable Message signs are used most frequently on high-density urban freeways, but have
applications on all types of highways where highway alignment, road user routing problems, or other
pertinent conditions require advance warning and information.

Portable Changeable Message signs have a wide variety of applications in TTC zones including:
roadway, lane, or ramp closures, crash or emergency incident management, width restriction information,
speed control or reductions, advisories on work scheduling, road user management and diversion, warning of
adverse conditions, or special events and other operational control.

The primary purpose of Portable Changeable Message signs in TTC zones is to advise the road user of
unexpected situations. Some typical applications include the following:

A. Where the speed of vehicular traffic is expected to drop substantially;
B. Where significant queuing and delays are expected;
C. Where adverse environmental conditions are present;
D. Where there are changes in alignment or surface conditions;
E. Where advance notice of ramp, lane, or roadway closures is needed;
F. Where crash or incident management is needed; and/or
G. Where changes in the road user pattern occur.

Guidance:

The components of a Portable Changeable Message sign should include: a message sign panel, control systems, a power source, and mounting and transporting equipment.

Portable Changeable Message signs should subscribe to the principles established in Section 2A.07 and other sections of this Manual and, to the extent practical, with the design (that is, color, letter size and shape, and borders) and applications prescribed in this Manual, except that the reverse colors for the letters and the background are considered acceptable.

The front face of the sign should be covered with a protective material. The color of the elements should be yellow or orange on a black background.

Portable Changeable Message signs should be visible from 800 m (0.5 mi) under both day and night conditions. For a trailer or large truck mounted sign, the letter height should be a minimum of 450 mm (18 in). For Changeable Message signs mounted on service patrol trucks, the letter height should be a minimum of 250 mm (10 in).

The message panel should have adjustable display rates (minimum of 3 seconds per phase), so that the entire message can be read at least twice at the posted speed, the off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed.

Messages should be designed taking into account the following factors:
A. Each phase should convey a single thought.
B. If the message can be displayed in one phase, the top line should present the problem, the center line should present the location or distance ahead, and the bottom line should present the recommended driver action.
C. The message should be as brief as possible
D. When a message is longer than two phases, additional Portable Changeable Message signs should be used
E. When abbreviations are used, they should be easily understood (see Section 1A.14).

Option:

The message sign panel may vary in size.

Smaller letter sizes may be used on a Portable Changeable Message sign mounted on a trailer or large truck provided that the message is legible from at least 200 m (650 ft), or mounted on a service patrol truck provided that the message is legible from at least 100 m (330 ft).

Two Portable Changeable Message signs may be used for the purpose of allowing the entire message to be read twice at the posted speed.

Standard:

Portable Changeable Message signs shall automatically adjust their brightness under varying light conditions, to maintain legibility.

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

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

The mounting of Portable Changeable Message signs on a trailer, a large truck, or a service patrol truck shall be such that the bottom of the message sign panel shall be a minimum of 2.1 m (7 ft) above
the roadway in urban areas and 1.5 m (5 ft) above the roadway in rural areas when it is in the operating mode.

The text of the messages shall not scroll or travel horizontally or vertically across the face of the sign.

Guidance:

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

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

The Portable Changeable Message signs should be sited and aligned to provide maximum legibility. Multiple Portable Changeable Message signs should be placed on the same side of the roadway, separated from each other at distances based on Table 6C-1.

Portable Changeable Message signs should be placed on the shoulder of the roadway or, if practical, further from the traveled lane. They should be delineated with retroreflective TTC devices. When Portable Changeable Message signs are not being used, they should be removed; if not removed, they should be shielded; or if the previous two options are not feasible, they should be delineated with retroreflective TTC devices.

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

Section 6F.56   Arrow Panels

Standard:

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

Guidance:

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

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

An arrow panel should be placed on the shoulder of the roadway or, if practical, further from the traveled lane. It should be delineated with retroreflective TTC devices. When an arrow panel is not being used, it should be removed; if not removed, it should be shielded; or if the previous two options are not feasible, it should be delineated with retroreflective TTC devices.

Standard:

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

Support:

Type A arrow panels are appropriate for use on low-speed urban streets. Type B arrow panels are appropriate for intermediate-speed facilities and for maintenance or mobile operations on high-speed roadways. Type C arrow panels are intended to be used on high-speed, high-volume motor vehicle traffic control projects.
Standard:

Arrow panels shall be rectangular, of solid appearance and shall be finished in nonreflective black.

The arrow panel shall be mounted on a vehicle, a trailer, or other suitable support.

Guidance:

The minimum mounting height of an arrow panel should be 2.1 m (7 ft) from the roadway to the bottom of the panel, except on vehicle-mounted panels, which should be as high as practical.

A vehicle-mounted arrow panel should be provided with remote controls.

Standard:

Arrow panel elements shall be capable of at least a 50 percent dimming from full brilliance. The dimmed mode shall be used for nighttime operation of arrow panels.

Guidance:

Full brilliance should be used for daytime operation of arrow panels.

Standard:

The arrow panel shall have suitable elements capable of the various operating modes. The color presented by the elements shall be yellow.

Guidance:

If an arrow panel consisting of a bulb matrix is used, the elements should be recess-mounted or equipped with an upper hood of not less than 180 degrees.

Standard:

The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 nor more than 40 flashes per minute.

An arrow panel shall have the following three mode selections:

A. A Flashing Arrow, Sequential Arrow, or Sequential Chevron mode; and
B. A flashing Double Arrow mode; and
C. A flashing Caution mode.

An arrow panel in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.

For shoulder work, blocking the shoulder, for roadside work near the shoulder, or for temporarily closing one lane on a two-lane, two-way roadway, an arrow panel shall be used only in the caution mode.

Guidance:

For a stationary lane closure, the arrow panel should be located on the shoulder at the beginning of the merging taper.

Where the shoulder is narrow, the arrow panel should be located in the closed lane.

Standard:

When arrow panels are used to close multiple lanes, a separate arrow panel shall be used for each closed lane.
Guidance:

When arrow panels are used to close multiple lanes, if the first arrow panel is placed on the shoulder, the second arrow panel should be placed in the first closed lane at the beginning of the second merging taper (see Figure 6H-37). When the first arrow panel is placed in the first closed lane, the second arrow panel should be placed in the second closed lane at the downstream end of the second merging taper.

For mobile operations where a lane is closed, the arrow panel should be located to provide adequate separation from the work operation to allow for appropriate reaction by approaching drivers.

Standard:
A vehicle displaying an arrow panel shall be equipped with high-intensity rotating, flashing, oscillating, or strobe lights.

Arrow panel(s) shall not be used to laterally shift traffic.

Option:
A portable changeable message sign may be used to simulate an arrow panel display.

Section 6F.57  High-Level Warning Devices (Flag Trees)

Option:
A high-level warning device (flag tree) may supplement other TTC devices in TTC zones.

Support:
A high-level warning device is designed to be seen over the top of typical passenger cars. A typical high-level warning device is shown in Figure 6F-2.

Standard:
A high-level warning device shall consist of a minimum of two flags with or without a Type B high-intensity flashing warning light. The distance from the roadway to the bottom of the lens of the light and to the lowest point of the flag material shall be not less than 2.4 m (8 ft). The flag shall be 400 mm (16 in) square or larger and shall be orange or fluorescent red-orange in color.

Option:
An appropriate warning sign may be mounted below the flags.

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

Section 6F.58  Channelizing Devices

Standard:
Designs of various channelizing devices shall be as shown in Figure 6F–7.

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

Channelizing devices provide for smooth and gradual vehicular traffic flow from one lane to another, onto a bypass or detour, or into a narrower traveled way. They are also used to separate vehicular traffic from the work space, pavement drop-offs, pedestrian or shared-use paths, or opposing directions of vehicular traffic.
Figure 6F-6. Advance Warning Arrow Display Specifications

Operating Mode

I. At least one of the three following modes shall be provided:

- Flashing Arrow

II. The following mode shall be provided:

- Flashing Double Arrow

III. The following mode shall be provided:

- Flashing Caution

Panel Display (Type C panel illustrated)

(Right arrow shown; left is similar)

Panel Type | Minimum Size | Minimum Legibility Distance | Minimum Number of Elements
------------|--------------|-----------------------------|-------------------------------
A           | 1200 x 600 mm (48 x 24 in) | 0.8 km (1/2 mi) | 12
B           | 1500 x 750 mm (60 x 30 in) | 1.2 km (3/4 mi) | 13
C           | 2400 x 1200 mm (96 x 48 in) | 1.6 km (1 mi) | 15

Standard:

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

Where barricades are used to channelize pedestrians, there shall be continuous detectable bottom and top rails with no gaps between individual barricades to be detectable to users of long canes. The bottom of the bottom rail shall be no higher than 150 mm (6 in) above the ground surface. The top of the top rail shall be no lower than 900 mm (36 in) above the ground surface.

Option:

A gap not exceeding 150 mm (6 in) between the bottom rail and the ground surface may be used to facilitate drainage.
Standard:

If drums, cones, or tubular markers are used to channelize pedestrians, they shall be located such that there are no gaps between the bases of the devices, in order to create a continuous bottom, and the height of each individual drum, cone, or tubular marker shall be no less than 900 mm (36 in) to be detectable to users of long canes.

Guidance:

Channelizing devices should be constructed and ballasted to perform in a predictable manner when inadvertently struck by a vehicle. Channelizing devices should be crashworthy. Fragments or other debris from the device or the ballast should not pose a significant hazard to road users or workers.

The spacing of channelizing devices should not exceed a distance in meters (feet) equal to 0.2 times the speed limit in km/h (1.0 times the speed limit in mph) when used for taper channelization, and a distance in meters (feet) equal to 0.4 times the speed limit in km/h (2.0 times the speed limit in mph) when used for tangent channelization.

When channelizing devices have the potential of leading vehicular traffic out of the intended vehicular traffic space as shown in Figure 6H-39, the channelizing devices should be extended a distance in meters (feet) of 0.4 times the speed limit in km/h (2.0 times the speed limit in mph) beyond the end of the transition area.

Option:

Warning lights may be added to channelizing devices in areas with frequent fog, snow, or severe roadway curvature, or where visual distractions are present.

Standard:

Warning lights shall flash when placed on channelizing devices used alone or in a cluster to warn of a condition. Warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.

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

Option:

The name and telephone number of the highway agency, contractor, or supplier may be shown on the nonretroreflective surface of all types of channelizing devices.

Standard:

The letters and numbers of the name and telephone number shall be nonretroreflective and not over 50 mm (2 in) in height.

Guidance:

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

Standard:

Devices that are damaged or have lost a significant amount of their retroreflectivity and effectiveness shall be replaced.

Section 6F.59 Cones

Standard:

Cones (see Figure 6F-7, Sheet 1 of 2) shall be predominantly orange and shall be made of a material that can be struck without causing damage to the impacting vehicle. For daytime and low-speed roadways, cones shall be not less than 450 mm (18 in) in height. When cones are used on
freeways and other high-speed highways or at night on all highways, or when more conspicuous guidance is needed, cones shall be a minimum of 700 mm (28 in) in height.

For nighttime use, cones shall be retroreflectorized or equipped with lighting devices for maximum visibility. Retroreflectorization of cones that are 700 to 900 mm (28 to 36 in) in height shall be provided by a 150 mm (6 in) wide white band located 75 to 100 mm (3 to 4 in) from the top of the cone and an additional 100 mm (4 in) wide white band located approximately 50 mm (2 in) below the 150 mm (6 in) band.

Retroreflectorization of cones that are more than 900 mm (36 in) in height shall be provided by horizontal, circumferential, alternating orange and white retroreflective stripes that are 100 to 150 mm (4 to 6 in) wide. Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflective spaces between the orange and white stripes shall not exceed 75 mm (3 in) in width.

Option:

Traffic cones may be used to channelize road users, divide opposing vehicular traffic lanes, divide lanes when two or more lanes are kept open in the same direction, and delineate short duration maintenance and utility work.

Guidance:

Steps should be taken to minimize the possibility of cones being blown over or displaced by wind or moving vehicular traffic.

Cones should not be used for pedestrian channelization or as pedestrian barriers in TTC zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.

Option:

Cones may be doubled up to increase their weight.

Support:

Some cones are constructed with bases that can be filled with ballast. Others have specially weighted bases, or weight such as sandbag rings that can be dropped over the cones and onto the base to provide added stability.

Guidance:

Ballast should be kept to the minimum amount needed.

Section 6F.60 Tubular Markers

Standard:

Tubular markers (see Figure 6F-7, Sheet 1 of 2) shall be predominantly orange and shall be not less than 450 mm (18 in) high and 50 mm (2 in) wide facing road users. They shall be made of a material that can be struck without causing damage to the impacting vehicle.

Tubular markers shall be a minimum of 700 mm (28 in) in height when they are used on freeways and other high-speed highways, on all highways during nighttime, or whenever more conspicuous guidance is needed.

For nighttime use, tubular markers shall be retroreflectorized. Retroreflectorization of 700 mm (28 in) or larger tubular markers shall be provided by two 75 mm (3 in) wide white bands placed a maximum of 50 mm (2 in) from the top with a maximum of 150 mm (6 in) between the bands.

Guidance:

Tubular markers should not be used for pedestrian channelization or as pedestrian barriers in TTC zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.
If drums, cones, or tubular markers are used to channelize pedestrians, they shall be located such that there are no gaps between the bases of the devices, in order to create a continuous bottom, and the height of each individual drum, cone, or tubular marker shall be no less than 900 mm (36 in) to be detectable to users of long canes.

Note: 300 mm (12 in) MAX.

More than 900 mm (36 in) MAX.

Tubular markers have less visible area than other devices and should be used only where space restrictions do not allow for the use of other more visible devices.

Tubular markers should be stabilized by affixing them to the pavement, by using weighted bases, or weights such as sandbag rings that can be dropped over the tubular markers and onto the base to provide added stability. Ballast should be kept to the minimum amount needed.

Option:

Tubular markers may be used effectively to divide opposing lanes of road users, divide vehicular traffic lanes when two or more lanes of moving vehicular traffic are kept open in the same direction, and to delineate the edge of a pavement drop-off where space limitations do not allow the use of larger devices.

Standard:

When a noncylindrical tubular marker is used, it shall be attached to the pavement in a manner such that the width facing road users meets the minimum requirements.

A tubular marker shall be attached to the pavement to display the minimum 50 mm (2 in) width to the approaching road users.
If barricades are used to channelize pedestrians, there shall be continuous detectable bottom and top rails with no gaps between individual barricades to be detectable to users of long canes. The bottom of the bottom rail shall be no higher than 150 mm (6 in) above the ground surface. The top of the top rail shall be no lower than 900 mm (36 in) above the ground surface.

**Note:**

- **900 mm (36 in)** MIN.
- **600 mm (24 in)** MIN.
- **200 to 300 mm (8 to 12 in)**

### Type I Barricade **

- **900 mm (36 in)** MIN.
- **600 mm (24 in)** MIN.
- **200 to 300 mm (8 to 12 in)**

### Type II Barricade **

- **900 mm (36 in)** MIN.
- **600 mm (24 in)** MIN.
- **200 to 300 mm (8 to 12 in)**

### Type III Barricade **

- **1.5 m (5 ft)** MIN.
- **1.2 m (4 ft)** MIN.
- **200 to 300 mm (8 to 12 in)**

### Direction Indicator Barricade **

- **900 mm (36 in)**
- **300 mm (12 in)**
- **200 mm (8 in)**

* Warning lights (optional)
** Rail stripe widths shall be 150 mm (6 in), except that 100 mm (4 in) wide stripes may be used if rail lengths are less than 900 mm (36 in). The sides of barricades facing traffic shall have retroreflective rail faces.

**Note:** If barricades are used to channelize pedestrians, there shall be continuous detectable bottom and top rails with no gaps between individual barricades to be detectable to users of long canes. The bottom of the bottom rail shall be no higher than 150 mm (6 in) above the ground surface. The top of the top rail shall be no lower than 900 mm (36 in) above the ground surface.

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**Section 6F. 61 Vertical Panels**

**Standard:**

Vertical panels (see Figure 6F-7, Sheet 1 of 2) shall be 200 to 300 mm (8 to 12 in) in width and at least 600 mm (24 in) in height. They shall have orange and white diagonal stripes and be retroreflectorized.

Vertical panels shall be mounted with the top a minimum of 900 mm (36 in) above the roadway.

Where the height of the vertical panel itself is 900 mm (36 in) or greater, a panel stripe width of 150 mm (6 in) shall be used.

**Option:**

Where the height of the vertical panel itself is less than 900 mm (36 in), a panel stripe width of 100 mm (4 in) may be used.
Standard:

Markings for vertical panels shall be alternating orange and white retroreflective stripes, sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass. Vertical panels used on freeways, expressways, and other high-speed roadways shall have a minimum of 169,000 mm² (270 in²) retroreflective area facing vehicular traffic.

Option:

Where space is limited, vertical panels may be used to channelize vehicular traffic, divide opposing lanes, or replace barricades.

Section 6F.62 Drums

Standard:

Drums (see Figure 6F-7, Sheet 1 of 2) used for road user warning or channelization shall be constructed of lightweight, deformable materials. They shall be a minimum of 900 mm (36 in) in height and have at least a 450 mm (18 in) minimum width regardless of orientation. Metal drums shall not be used. The markings on drums shall be horizontal, circumferential, alternating orange and white retroreflective stripes 100 to 150 mm (4 to 6 in) wide. Each drum shall have a minimum of two orange and two white stripes with the top stripe being orange. Any nonretroreflectorized spaces between the horizontal orange and white stripes shall not exceed 75 mm (3 in) wide. Drums shall have closed tops that will not allow collection of construction debris or other debris.

Support:

Drums are highly visible, have good target value, give the appearance of being formidable obstacles and, therefore, command the respect of road users. They are portable enough to be shifted from place to place within a TTC zone in order to accommodate changing conditions, but are generally used in situations where they will remain in place for a prolonged period of time.

Option:

Although drums are most commonly used to channelize or delineate road user flow, they may also be used alone or in groups to mark specific locations.

Guidance:

Drums should not be used for pedestrian channelization or as pedestrian barriers in TTC zones on or along sidewalks unless they are continuous between individual devices and detectable to users of long canes.

Drums should not be weighted with sand, water, or any material to the extent that would make them hazardous to road users or workers when struck. Drums used in regions susceptible to freezing should have drain holes in the bottom so that water will not accumulate and freeze causing a hazard if struck by a road user.

Standard:

Ballast shall not be placed on the top of a drum.

Section 6F.63 Type I, II, or III Barricades

Support:

A barricade is a portable or fixed device having from one to three rails with appropriate markings and is used to control road users by closing, restricting, or delineating all or a portion of the right-of-way.

As shown in Figure 6F-7, Sheet 2 of 2, barricades are classified as either Type I, Type II, or Type III.
Standard:

Stripes on barricade rails shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Except as noted in the Option, the stripes shall be 150 mm (6 in) wide.

Option:

When rail lengths are less than 900 mm (36 in), 100 mm (4 in) wide stripes may be used.

Standard:

The minimum length for Type I and Type II Barricades shall be 600 mm (24 in), and the minimum length for Type III Barricades shall be 1200 mm (48 in). Each barricade rail shall be 200 to 300 mm (8 to 12 in) wide. Barricades used on freeways, expressways and other high-speed roadways shall have a minimum of 169,000 mm$^2$ (270 in$^2$) of retroreflective area facing road users.

Guidance:

Where barricades extend entirely across a roadway, the stripes should slope downward in the direction toward which road users must turn.

Where both right and left turns are provided, the barricade stripes should slope downward in both directions from the center of the barricade or barricades.

Where no turns are intended, the stripes should be positioned to slope downward toward the center of the barricade or barricades.

Barricade rails should be supported in a manner that will allow them to be seen by the road user, and in a manner that provides a stable support that is not easily blown over or displaced.

The width of the existing pedestrian facility should be provided for the temporary facility if practical. Traffic control devices and other construction materials and features should not intrude into the usable width of the sidewalk, temporary pathway, or other pedestrian facility. When it is not possible to maintain a minimum width of 1500 mm (60 in) throughout the entire length of the pedestrian pathway, a 1500 x 1500 mm (60 x 60 in) passing space should be provided at least every 60 m (200 ft) to allow individuals in wheelchairs to pass.

Barricade rail supports should not project into pedestrian circulation routes more than 100 mm (4 in) from the support between 675 mm (27 in) and 2000 mm (80 in) from the surface as described in Section 4.4.1 of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)” (see Section 1A.11).

Option:

For Type I Barricades, the support may include other unstriped horizontal panels necessary to provide stability.

Guidance:

Barricades should be crashworthy as they are located adjacent to vehicular traffic flow and are subject to impact by errant vehicles.

On high-speed expressways or in other situations where barricades may be susceptible to overturning in the wind, ballasting should be used.

Option:

Sandbags may be placed on the lower parts of the frame or the stays of barricades to provide the required ballast.
Standard:

Ballast shall not be placed on top of any striped rail. Barricades shall not be ballasted by nondeformable objects such as rocks or chunks of concrete. Ballast shall not extend into the accessible passage width of 1500 mm (60 in).

Support:

Type I or Type II Barricades are intended for use in situations where road user flow is maintained through the TTC zone.

Option:

Barricades may be used alone or in groups to mark a specific condition or they may be used in a series for channelizing road users.

Type I Barricades may be used on conventional roads or urban streets.

Guidance:

Type II or Type III Barricades should be used on freeways and expressways or other high-speed roadways. Type III Barricades should be used to close or partially close a road.

Option:

Type III Barricades used at a road closure may be placed completely across a roadway or from curb to curb.

Guidance:

Where provision is made for access of authorized equipment and vehicles, the responsibility for Type III Barricades should be assigned to a person who will provide proper closure at the end of each work day.

Support:

When a highway is legally closed but access must still be allowed for local road users, barricades usually are not extended completely across the roadway.

Standard:

A sign (see Section 6F.09) shall be installed with the appropriate legend concerning permissible use by local road users. Adequate visibility of the barricades from both directions shall be provided.

Option:

Signs may be installed on barricades (see Section 6F.03).

Section 6F.64  Direction Indicator Barricades

Standard:

The Direction Indicator Barricade (see Figure 6F-7, Sheet 2 of 2) shall consist of a One-Direction Large Arrow (W1-6) sign mounted above a diagonal striped, horizontally aligned, retroreflective rail.

The One-Direction Large Arrow (W1-6) sign shall be black on an orange background. The stripes on the bottom rail shall be alternating orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. The stripes shall be 100 mm (4 in) wide. The One-Direction Large Arrow (W1-6) sign shall be 600 x 300 mm (24 x 12 in). The bottom rail shall have a length of 600 mm (24 in) and a height of 200 mm (8 in).

Guidance:

The Direction Indicator Barricade, including any associated ballast or lights, should be crashworthy.
Option:

The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.

Guidance:

If used, Direction Indicator Barricades should be used in series to direct the driver through the transition and into the intended travel lane.

**Section 6F.65 Temporary Traffic Barriers as Channelizing Devices**

**Support:**

Temporary traffic barriers are not TTC devices in themselves; however, when placed in a position identical to a line of channelizing devices and marked and/or equipped with appropriate channelization features to provide guidance and warning both day and night, they serve as TTC devices.

**Standard:**

Temporary traffic barriers serving as TTC devices shall conform to requirements for such devices as set forth throughout Part 6.

Temporary traffic barriers shall not be used solely to channelize road users, but also to protect the work space (see Section 6F.81). If used to channelize vehicular traffic, the temporary traffic barrier shall be supplemented with delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility.

**Guidance:**

Temporary traffic barriers should not be used for a merging taper except in low-speed urban areas. Temporary traffic barriers should not be used for a constricted/restricted TTC zone.

When it is necessary to use a temporary traffic barrier for a merging taper in low-speed urban areas or for a constricted/restricted TTC zone, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.

When used for channelization, temporary traffic barriers should be of a light color for increased visibility.

**Section 6F.66 Longitudinal Channelizing Barricades**

**Support:**

Longitudinal channelizing barricades are lightweight, deformable channelizing devices that can be used singly as Type I, II, or III barricades, or connected so they are highly visible and have good target value.

**Guidance:**

When used as a barricade, longitudinal channelizing barricades should conform to the general size, color, stripe pattern, retroreflectivity, and placement characteristics established for the devices described in Chapter 6F.

**Option:**

Longitudinal channelizing barricades may be used instead of a line of cones, drums, or barricades.

Longitudinal channelizing barricades may be hollow and filled with water as a ballast.

**Guidance:**

If used, longitudinal channelizing barricades should be interlocked to delineate or channelize flow including pedestrian traffic control. The interlocking barricade wall should not have gaps that allow pedestrians or vehicles to stray from the channelizing path.
Support:

Longitudinal channelizing barricades are often located adjacent to traffic and therefore are subject to impact by errant vehicles.

Guidance:

Because of their vulnerable position, longitudinal channelizing barricades should be constructed of lightweight materials and be crashworthy.

Although longitudinal channelizing barricades might give the appearance of being formidable obstacles, they have not met the crashworthy requirements for temporary traffic barriers and, therefore, should not be used to shield pedestrians, including workers, from vehicle impacts or obstacles.

Option:

Longitudinal channelizing barricades may be used to channelize pedestrians.

Section 6F.67 Other Channelizing Devices

Option:

Channelizing devices other than those described in this Chapter may be used in special situations based on an engineering study.

Guidance:

Other channelizing devices should conform to the general size, color, stripe pattern, retroreflection, and placement characteristics established for the devices described in this Chapter.

Section 6F.68 Detectable Edging for Pedestrians

Support:

Individual channelizing devices, tape or rope used to connect individual devices, other discontinuous barriers and devices, and pavement markings are not detectable by persons with visual disabilities and are incapable of providing detectable path guidance on temporary or realigned sidewalks or other pedestrian facilities.

Guidance:

When it is determined that a facility should be accessible to and detectable by pedestrians with visual disabilities, a continuously detectable edging should be provided throughout the length of the facility such that it can be followed by pedestrians using long canes for guidance. This edging should protrude at least 150 mm (6 in) above the surface of the sidewalk or pathway, with the bottom of the edging a maximum of 62 mm (2.5 in) above the surface. This edging should be continuous throughout the length of the facility except for gaps at locations where pedestrians or vehicles will be turning or crossing. This edging should consist of a prefabricated or formed-in-place curbing or other continuous device that is placed along the edge of the sidewalk or walkway. This edging should be firmly attached to the ground or to other devices. Adjacent sections of this edging should be interconnected such that the edging is not displaced by pedestrian or vehicular traffic or work operations, and such that it does not constitute a hazard to pedestrians, workers, or other road users.

Support:

Examples of detectable edging for pedestrians include:

A. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected and fixed in place to form a continuous edge.

B. Prefabricated lightweight sections of plastic, metal, or other suitable materials that are interconnected, fixed in place, and placed at ground level to provide a continuous connection between channelizing devices located at intervals along the edge of the sidewalk or walkway.

C. Sections of lumber interconnected and fixed in place to form a continuous edge.
D. Formed-in-place asphalt or concrete curb.
E. Prefabricated concrete curb sections that are interconnected and fixed in place to form a continuous edge.
F. Continuous temporary traffic barrier or longitudinal channelizing barricades placed along the edge of the sidewalk or walkway that provides a pedestrian edging at ground level.
G. Chain link or other fencing equipped with a continuous bottom rail.

Guidance:
Detectable pedestrian edging should be orange, white, or yellow and should match the color of the adjacent channelizing devices or traffic control devices, if any are present.

Section 6F.69  Temporary Raised Islands

Standard:
Temporary raised islands shall be used only in combination with pavement striping and other suitable channelizing devices.

Guidance:
Temporary raised islands should only be used on roadways with speeds of 70 km/h (40 mph) or less except when recommended by an engineering study.

Option:
A temporary raised island may be used to separate vehicular traffic flows in two-lane, two-way operations on roadways having a vehicular traffic volume range of 4,000 to 15,000 average daily traffic (ADT) and on freeways having a vehicular traffic volume range of 22,000 ADT to 60,000 ADT.
Temporary raised islands also may be used in other than two-lane, two-way operations where physical separation of vehicular traffic from the TTC zone is not required.

Pavement edge lines may be placed on the island itself.

Guidance:
Temporary raised islands should have the basic dimensions of 100 mm (4 in) high by at least 450 mm (18 in) wide and have rounded or chamfered corners.

The temporary raised islands should not be designed in such a manner that they would cause a motorist to lose control of the vehicle if the vehicle inadvertently strikes the temporary raised island. If struck, pieces of the island should not be dislodged to the extent that they could penetrate the occupant compartment or involve other vehicles.

Standard:
At pedestrian crossing locations, temporary raised islands shall have an opening or be shortened to provide at least a 1500 mm (60 in) wide pathway for the crossing pedestrian.

Section 6F.70  Opposing Traffic Lane Divider

Support:
Opposing traffic lane dividers are delineation devices used as center lane dividers to separate opposing vehicular traffic on a two-lane, two-way operation.

Standard:
Opposing traffic lane dividers shall not be placed across pedestrian crossings.

The Opposing Traffic Lane Divider (W6-4) sign (see Figure 6F-4, Sheet 2 of 4) is an upright, retroreflective orange-colored sign placed on a flexible support and sized at least 300 mm (12 in) wide by 450 mm (18 in) high.
Separation of opposing traffic lanes by use of this device shall be limited to locations where speeds are 70 km/h (40 mph) or less.

OMUTCD - English units are preferred.
Section 6F.71  Pavement Markings

Standard:

The provisions of this Section shall not be considered applicable for short-term, mobile, or incident management TTC zones.

Pavement markings shall be maintained along paved streets and highways in all long- and intermediate-term stationary (see Section 6G.02) TTC zones. All pavement markings shall be in accordance with Chapters 3A and 3B, except as indicated in Section 6F.72. Pavement markings shall match the markings in place at both ends of the TTC zone. Pavement markings shall be placed along the entire length of any surfaced detour or temporary roadway prior to the detour or roadway being opened to road users.

Warning signs, channelizing devices, and delineation shall be used to indicate required road user paths in TTC zones where it is not possible to provide a clear path by pavement markings. All pavement markings and devices used to delineate road user paths shall be carefully reviewed during daytime and nighttime periods.

For long-term stationary operations, pavement markings in the temporary traveled way that are no longer applicable shall be removed or obliterated as soon as practical. Pavement marking obliteration shall leave a minimum of pavement scars and shall remove old marking material. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration.

Guidance:

Road users should be provided pavement markings within a TTC zone comparable to the pavement markings normally maintained along such roadways, particularly at either end of the TTC zone.

The intended vehicle path should be defined in day, night, and twilight periods under both wet and dry pavement conditions.

The work should be planned and staged to provide for the placement and removal of the pavement markings.

Markings should be provided in intermediate-term stationary work zones.

Option:

Removable, nonreflective, preformed tape may be used where markings need to be covered temporarily.

Section 6F.72  Temporary Pavement Markings

Support:

Temporary pavement markings are those that are allowed to remain in place until the earliest date when it is practical and possible to install pavement markings that meet the Part 3 standards for pavement markings.

See Section 6F.44 for information on use of the NO CENTER LINE (W8-H12) sign and the NO EDGE LINE (W8-H12a) sign.

Guidance:

Temporary pavement markings should not be in place for more than 2 weeks unless justified by an engineering study.

Standard:

All temporary pavement markings, including pavement markings for no-passing zones, shall conform to the requirements of Chapters 3A and 3B. All temporary broken-line pavement markings shall use the same cycle length as permanent markings and be at least 0.6 m (2 ft) long.
Option:

Half-cycle lengths with a minimum of 0.6 m (2 ft) stripes may be used on roadways with severe curvature (see Section 3A.05) for centerlines in passing zones and for lane lines.

For temporary situations of 3 calendar days or less, for a two- or three-lane road, no-passing zones may be identified by using DO NOT PASS (R4-1), PASS WITH CARE (R4-2), and NO PASSING ZONE (W14-3) signs (see Sections 2B.29, 2B.30, and 2C.35) rather than pavement markings. Also, DO NOT PASS, PASS WITH CARE, and NO PASSING ZONE signs may be used instead of pavement markings on roads with low volumes for longer periods in accordance with the highway agency's policy.

Guidance:

If used, the DO NOT PASS, PASS WITH CARE, and NO PASSING ZONE signs should be placed in accordance with Sections 2B.29, 2B.30, and 2C.35.

The temporary use of edge lines, channelizing lines, lane reduction transitions, gore markings, and other longitudinal markings, and the various nonlongitudinal markings (such as stop lines, railroad crossings, crosswalks, words or symbols) should be in accordance with the highway agency's policy.

Support:

The ODOT “Traffic Engineering Manual” (see Section 1A.11) includes additional information about the Ohio Department of Transportation's policy regarding temporary pavement marking on ODOT-maintained highways.

Section 6F.73  Raised Pavement Markers

Standard:

If raised pavement markers are used to substitute for broken line segments, at least two retroreflective markers shall be placed, one at each end of a segment of 0.6 m to 1.5 m (2 to 5 ft) in length. For segments longer than 1.5 m (5 ft), a group of at least three retroreflective markers shall be equally spaced at no greater than N/8 (see Section 3B.11). The value of N for a broken or dotted line shall equal the length of one line segment plus one gap. The value of N referenced for solid lines shall equal the N for the broken or dotted lines that might be adjacent to or might extend the solid lines (see Sections 3B.13 and 3B.14).

Guidance:

Raised pavement markers should be considered for use along surfaced detours or temporary roadways, and other changed or new travel-lane alignments.

Option:

Retroreflective or internally illuminated raised pavement markers, or nonretroreflective raised pavement markers supplemented by retroreflective or internally illuminated markers, may replace or supplement markings prescribed in Chapters 3A and 3B.

Section 6F.74  Delineators

Standard:

When used, delineators shall combine with or supplement other TTC devices. They shall be mounted on crashworthy supports so that the reflecting unit is approximately 1.2 m (4 ft) above the near roadway edge. The standard color for delineators used along both sides of two-way streets and highways and the right side of one-way roadways shall be white. Delineators used along the left side of one-way roadways shall be yellow.

Guidance:

Spacing along roadway curves should be as set forth in Section 3D.04 and should be such that several delineators are always visible to the driver.
Option:

Delineators may be used in TTC zones to indicate the alignment of the roadway and to outline the required vehicle path through the TTC zone.

Section 6F.75 Lighting Devices

Guidance:

Lighting devices should be provided in TTC zones based on engineering judgment.

When used to supplement channelization, the maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

Support:

Four types of lighting devices are commonly used in TTC zones. They are floodlights, flashing warning beacons, warning lights, and steady-burn electric lamps.

Option:

Lighting devices may be used to supplement retroreflectorized signs, barriers, and channelizing devices.

During normal daytime maintenance operations, the functions of flashing warning beacons may be provided by high-intensity rotating, flashing, oscillating, or strobe lights on a maintenance vehicle.

Standard:

Although vehicle hazard warning lights are permitted to be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights, they shall not be used instead of high-intensity rotating, flashing, oscillating, or strobe lights.

Section 6F.76 Floodlights

Support:

Utility, maintenance, or construction activities on highways are frequently conducted during nighttime periods when vehicular traffic volumes are lower. Large construction projects are sometimes operated on a double-shift basis requiring night work (see Section 6G.20).

Guidance:

When nighttime work is being performed, floodlights should be used to illuminate the work area, equipment crossings, and other areas.

Standard:

Except in emergency situations, flagger stations shall be illuminated at night.

Floodlighting shall not produce a disabling glare condition for approaching road users, flaggers, or workers.

Guidance:

The adequacy of the floodlight placement and elimination of potential glare should be determined by driving through and observing the floodlighted area from each direction on all approaching roadways after the initial floodlight setup, at night, and periodically.

Support:

Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of 50 lux (5 foot candles) can be adequate for general activities. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 216 lux (20 foot candles).
Section 6F.77  Flashing Warning Beacons

Support:

Flashing warning beacons are often used to supplement a TTC device.

Standard:

Flashing warning beacons shall comply with the provisions of Chapter 4K. A flashing warning beacon shall be a flashing yellow light with a minimum nominal diameter of 200 mm (8 in).

Guidance:

Flashing warning beacons should be operated 24 hours per day.

Support:

The temporary terminus of a freeway is an example of a location where flashing warning beacons alert drivers to the changing roadway conditions and the need to reduce speed in transitioning from the freeway to another roadway type.

Section 6F.78  Warning Lights

Support:

Type A, Type B, Type C, and Type D 360-degree warning lights are portable, powered, yellow, lens-directed, enclosed lights.

Standard:

Warning lights shall be in accordance with the current ITE “Purchase Specification for Flashing and Steady-Burn Warning Lights” (see Section 1A.11).

When warning lights are used, they shall be mounted on signs or channelizing devices in a manner that, if hit by an errant vehicle, they will not be likely to penetrate the windshield.

Guidance:

The maximum spacing for warning lights should be identical to the channelizing device spacing requirements.

Support:

The light weight and portability of warning lights are advantages that make these devices useful as supplements to the retroreflectorization on signs and channelizing devices. The flashing lights are effective in attracting road users' attention.

Option:

Warning lights may be used in either a steady-burn or flashing mode.

Standard:

Flashing warning lights shall not be used for delineation, as a series of flashers fails to identify the desired vehicle path.

Type A Low-Intensity Flashing warning lights, Type C Steady-Burn warning lights, and Type D 360-degree Steady-Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 900 m (3,000 ft). Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 300 m (1,000 ft).

Warning lights shall have a minimum mounting height of 750 mm (30 in) to the bottom of the lens.
Support:
Type A Low-Intensity Flashing warning lights are used to warn road users during nighttime hours that they are approaching or proceeding in a potentially hazardous area.

Option:
Type A warning lights may be mounted on channelizing devices.

Support:
Type B High-Intensity Flashing warning lights are used to warn road users during both daylight and nighttime hours that they are approaching a potentially hazardous area.

Option:
Type B warning lights are designed to operate 24 hours per day and may be mounted on advance warning signs or on independent supports.

Type C Steady-Burn warning lights and Type D 360-degree Steady-Burn warning lights may be used during nighttime hours to delineate the edge of the traveled way.

Guidance:
When used to delineate a curve, Type C and Type D 360-degree warning lights should only be used on devices on the outside of the curve, and not on the inside of the curve.

Section 6F.79 Steady-Burn Electric Lamps

Support:
Steady-Burn electric lamps are a series of low-wattage, yellow, electric lamps, generally hard-wired to a 110-volt external power source.

Option:
Steady-Burn electric lamps may be used in place of Type C Steady-Burn warning lights (see Section 6F.78).

Section 6F.80 Temporary Traffic Control Signals

Standard:
Temporary traffic control signals (see Section 4D.20) used to control road user movements through TTC zones and in other TTC situations shall meet the applicable provisions of Part 4.

Support:
Temporary traffic control signals are typically used in TTC zones such as temporary haul road crossings; temporary one-way operations along a one-lane, two-way highway; temporary one-way operations on bridges, reversible lanes, and intersections.

Standard:
One-lane, two-way vehicular traffic flow (see Chapter 4G) requires an all-red interval of sufficient duration for road users to clear the portion of the TTC zone controlled by the traffic control signals. Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.

Guidance:
Where pedestrian traffic is detoured to a temporary traffic control signal, engineering judgment should be used to determine if pedestrian signals or accessible pedestrian signals (see Section 4E.06) are needed for crossing along an alternate route.
When temporary traffic control signals are used, conflict monitors typical of traditional traffic control signal operations should be used.

Option:

Temporary traffic control signals may be portable or temporarily mounted on fixed supports.

**Standard:**

The supports for temporary traffic control signals shall not encroach into the minimum required width of a “pedestrian access route” of 1200 mm (48 in) or an “alternate circulation path” or 900 mm (36 in).

**Guidance:**

Temporary traffic control signals should only be used in situations where temporary traffic control signals are preferable to other means of traffic control, such as changing the work staging or work zone size to eliminate one-way vehicular traffic movements, using flaggers to control one-way or crossing movements, using STOP or YIELD signs, and using warning devices alone.

**Support:**

Factors related to the design and application of temporary traffic control signals include the following:

A. Safety and road user needs;
B. Work staging and operations;
C. The feasibility of using other TTC strategies (for example, flaggers, providing space for two lanes, or detouring road users, including bicyclists and pedestrians);
D. Sight distance restrictions;
E. Human factors considerations (for example, lack of driver familiarity with temporary traffic control signals);
F. Road-user volumes including roadway and intersection capacity;
G. Affected side streets and driveways;
H. Vehicle speeds;
I. The placement of other TTC devices;
J. Parking;
K. Turning restrictions;
L. Pedestrians;
M. The nature of adjacent land uses (such as residential or commercial);
N. Legal authority;
O. Signal phasing and timing requirements;
P. Full-time or part-time operation;
Q. Actuated, fixed-time, or manual operation;
R. Power failures or other emergencies;
S. Inspection and maintenance needs;
T. Need for detailed placement, timing, and operation records; and
U. Operation by contractors or by others.

Although temporary traffic control signals can be mounted on trailers or lightweight portable supports, fixed supports offer superior resistance to displacement or damage by severe weather, vehicle impact, and vandalism.

**Guidance:**

Other TTC devices should be used to supplement temporary traffic control signals, including warning and regulatory signs, pavement markings, and channelizing devices.

The design and placement of temporary traffic control signals should include interconnection to other traffic control signals along the subject roadway.

Temporary traffic control signals not in use should be covered or removed.
Section 6F.81  Temporary Traffic Barriers

Support:

Temporary traffic barriers are devices designed to help prevent penetration by vehicles while minimizing injuries to vehicle occupants, and are designed to protect workers, bicyclists, and pedestrians.

The four primary functions of temporary traffic barriers are:

A. To keep vehicular traffic from entering work areas, such as excavations or material storage sites;
B. To separate workers, bicyclists, and pedestrians from motor vehicle traffic;
C. To separate opposing directions of vehicular traffic; and
D. To separate vehicular traffic, bicyclists, and pedestrians from the work area such as false work for bridges and other exposed objects.

Option:

Temporary traffic barriers, including shifting portable or movable barrier installations to accommodate varying directional vehicular traffic demands, may be used to separate two-way vehicular traffic.

Guidance:

Because the protective requirements of a TTC situation have priority in determining the need for temporary traffic barriers, their use should be based on an engineering study. When serving the additional function of channelizing vehicular traffic (see Section 6F.65), temporary traffic barriers should be a light color for increased visibility.

Standard:

Temporary traffic barriers shall be supplemented with standard delineation, pavement markings, or channelizing devices for improved daytime and nighttime visibility if they are used to channelize vehicular traffic. The delineation color shall match the applicable pavement marking color.

In order to mitigate the effect of striking the end of a temporary traffic barrier, the end shall be installed in accordance with AASHTO's “Roadside Design Guide” (see Section 1A.11) by flaring until the end is outside the acceptable clear zone or by providing crashworthy end treatments.

Option:

Warning lights or steady-burn electric lamps may be mounted on temporary traffic barrier installations.

Support:

A movable barrier is a linear system of connected barrier segments that can rapidly be shifted laterally by using a specially designed transfer vehicle. The transfer is accomplished in a manner that does not interfere with vehicular traffic in adjacent lanes. Applications of movable barriers include the following:

A. Closing an additional lane during work periods while maintaining the advantage of having the travel way separated from the work space by a barrier;
B. Closing an additional lane during off-peak periods to provide extra space for work activities without adversely impacting vehicular traffic flow; and
C. Creating a temporary reversible lane, thus providing unbalanced capacity favoring the major direction of vehicular traffic flow.

More specific information on the use of temporary traffic barriers is contained in Chapters 8 and 9 of AASHTO’s “Roadside Design Guide” (see Section 1A.11).

Section 6F.82  Crash Cushions

Support:

Crash cushions are systems that mitigate the effects of errant vehicles that strike obstacles, either by smoothly decelerating the vehicle to a stop when hit head-on, or by redirecting the errant vehicle. The two
types of crash cushions that are used in TTC zones are stationary crash cushions and truck-mounted attenuators. Crash cushions in TTC zones help protect the drivers from the exposed ends of barriers, fixed objects, shadow vehicles, and other obstacles. Specific information on the use of crash cushions can be found in AASHTO’s “Roadside Design Guide” (see Section 1A.11).

**Standard:**

Crash cushions shall be crashworthy. They shall also be designed for each application to stop or redirect errant vehicles under prescribed conditions. Crash cushions shall be periodically inspected to verify that they have not been hit or damaged. Damaged crash cushions shall be promptly repaired or replaced to maintain their crashworthiness.

**Support:**

Stationary crash cushions are used in the same manner as permanent highway installations to protect drivers from the exposed ends of barriers, fixed objects, and other obstacles.

**Standard:**

Stationary crash cushions shall be designed for the specific application intended.

**Truck-mounted attenuators** shall be energy-absorbing devices attached to the rear of shadow trailers or trucks. If used, the shadow vehicle with the attenuator shall be located in advance of the work area, workers, or equipment to reduce the severity of rear-end crashes from errant vehicles.

**Support:**

Trucks or trailers are often used as shadow vehicles to protect workers or work equipment from errant vehicles. These shadow vehicles are normally equipped with flashing arrows, changeable message signs, and/or high-intensity rotating, flashing, oscillating, or strobe lights located properly in advance of the workers and/or equipment that they are protecting. However, these shadow vehicles might themselves cause injuries to occupants of the errant vehicles if they are not equipped with truck-mounted attenuators.

**Guidance:**

The shadow truck should be positioned a sufficient distance in advance of the workers or equipment being protected so that there will be sufficient distance, but not so much so that errant vehicles will travel around the shadow truck and strike the protected workers and/or equipment.

**Support:**

Chapter 9 of AASHTO’s “Roadside Design Guide” (see Section 1A.11) contains additional information regarding the use of shadow vehicles.

**Guidance:**

If used, the truck-mounted attenuator should be used in accordance with the manufacturer’s specifications.

**Section 6F.83 Vehicle-Arresting Systems**

**Support:**

Vehicle-arresting systems are designed to prevent penetration into activity areas while providing for smooth, reasonably safe deceleration for the errant vehicles. They can consist of portable netting, cables, and energy-absorbing anchors.

**Guidance:**

When used, a vehicle-arresting system should be used in accordance with the manufacturer’s specifications, and should be located so that vehicles are not likely to penetrate the location that the system is designed to protect.
Section 6F.84  Rumble Strips

Support:

Transverse rumble strips consist of intermittent narrow, transverse areas of rough-textured or slightly raised or depressed road surface that extend across the travel lanes to alert drivers to unusual vehicular traffic conditions. Through noise and vibration they attract the driver’s attention to such features as unexpected changes in alignment and to conditions requiring a stop.

Longitudinal rumble strips consist of a series of rough-textured or slightly raised or depressed road surfaces located along the shoulder to alert road users that they are leaving the travel lanes.

Standard:

If it is desirable to use a color other than the color of the pavement for a longitudinal rumble strip, the color of the rumble strip shall be the same color as the longitudinal line the rumble strip supplements.

If the color of a transverse rumble strip used within a travel lane is not the color of the pavement, the color of the rumble strip shall be white.

Option:

Intervals between transverse rumble strips may be reduced as the distance to the approached conditions is diminished in order to convey an impression that a closure speed is too fast and/or that an action is imminent. A sign warning drivers of the onset of rumble strips may be placed in advance of any transverse rumble strip installation.

Guidance:

Transverse rumble strips should be placed transverse to vehicular traffic movement. They should not adversely affect overall pavement skid resistance under wet or dry conditions.

In urban areas, even though a closer spacing might be warranted, transverse rumble strips should be designed in a manner that does not promote unnecessary braking or erratic steering maneuvers by road users.

Transverse rumble strips should not be placed on sharp horizontal or vertical curves.

Rumble strips should not be placed through pedestrian crossings or on bicycle routes.

Transverse rumble strips should not be placed on roadways used by bicyclists unless a minimum clear path of 1.2 m (4 ft) is provided at each edge of the roadway or on each paved shoulder as described in AASHTO’s “Guide to the Development of Bicycle Facilities” (see Section 1A.11).

Longitudinal rumble strips should not be placed on the shoulder of a roadway that is used by bicyclists unless a minimum clear path of 1.2 m (4 ft) is also provided on the shoulder.

Sections 6F.85  Screens

Support:

Screens are used to block the road users’ view of activities that can be distracting. Screens might improve safety and vehicular traffic flow where volumes approach the roadway capacity because they discourage gawking and reduce headlight glare from oncoming vehicular traffic.

Guidance:

Screens should not be mounted where they could adversely restrict road user visibility and sight distance and adversely affect the reasonably safe operation of vehicles.

Option:

Screens may be mounted on the top of temporary traffic barriers that separate two-way motor vehicle traffic.
Guidance:

Design of screens should be in accordance with Chapter 9 of AASHTO’s “Roadside Design Guide” (see Section 1A.11).

Section 6F.86 Future and Experimental Devices

Support:

The States, FHWA, AASHTO, the Transportation Research Board, and other organizations conduct research and experimentation on new traffic control and safety devices. Users of this Manual are encouraged to stay abreast of these current efforts and to use such devices with care so as to avoid presenting road users with unusual or confusing situations that might be abnormal or unexpected.

Standard:

New traffic control devices shall conform to the provisions for design, use, and application set forth in this Manual. New traffic control devices that do not conform with the provisions in this Manual shall be subject to experimentation, documentation, and adoption following the provisions of Section 1A.10.
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CHAPTER 6G.  TYPE OF TEMPORARY TRAFFIC
CONTROL ZONE ACTIVITIES

Section 6G.01  Typical Applications

Support:
Whenever the acronym “TTC” is used in this Chapter, it refers to “temporary traffic control.”

Standard:
The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:
Each TTC zone is different. Many variables, such as location of work, highway type, geometrics, vertical and horizontal alignment, intersections, interchanges, road user volumes, road vehicle mix (buses, trucks, and cars), and road user speeds affect the needs of each zone. The goal of TTC in work zones is safety with minimum disruption to road users. The key factor in promoting TTC zone safety is proper judgment.

Typical applications (TAs) of TTC zones are organized according to duration, location, type of work, and highway type. Table 6H-1 is an index of these typical applications. These typical applications include the use of various TTC methods, but do not include a layout for every conceivable work situation.

Guidance:
Typical applications should be altered, when necessary, to fit the conditions of a particular TTC zone.

Option:
Other devices may be added to supplement the devices shown in the typical applications, while others may be deleted. The sign spacings and taper lengths may be increased to provide additional time or space for driver response.

Support:
Decisions regarding the selection of the most appropriate typical application to use as a guide for a specific TTC zone require an understanding of each situation. Although there are many ways of categorizing TTC zone applications, the four factors mentioned earlier (work duration, work location, work type, and highway type) are used to characterize the typical applications illustrated in Chapter 6H.

Section 6G.02  Work Duration

Support:
Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Work duration is a major factor in determining the number and types of devices used in TTC zones. The duration of a TTC zone is defined relative to the length of time a work operation occupies a spot location.

Standard:
The five categories of work duration and their time at a location shall be:
A.  Long-term stationary is work that occupies a location more than 3 days.
B.  Intermediate-term stationary is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
C.  Short-term stationary is daytime work that occupies a location for more than 1 hour within a single daylight period.
D. Short duration is work that occupies a location up to 1 hour.
E. Mobile is work that moves intermittently or continuously.

Support:
At long-term stationary TTC zones, there is ample time to install and realize benefits from the full range of TTC procedures and devices that are available for use. Generally, larger channelizing devices, temporary roadways, and temporary traffic barriers are used.

Standard:
Since long-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in long-term stationary TTC zones.

Guidance:
Inappropriate markings in long-term stationary TTC zones should be removed and replaced with temporary markings.

Support:
In intermediate-term stationary TTC zones, it might not be feasible or practical to use procedures or devices that would be desirable for long-term stationary TTC zones, such as altered pavement markings, temporary traffic barriers, and temporary roadways. The increased time to place and remove these devices in some cases could significantly lengthen the project, thus increasing exposure time. In other instances, there might be insufficient pay-back time to economically justify more elaborate TTC measures.

Standard:
Since intermediate-term operations extend into nighttime, retroreflective and/or illuminated devices shall be used in intermediate-term stationary TTC zones.

Support:
Most maintenance and utility operations are short-term stationary work.

As compared to stationary operations, mobile and short-duration operations are activities that might involve different treatments. Devices having greater mobility might be necessary such as signs mounted on trucks. Devices that are larger, more imposing, or more visible can be used effectively and economically. The mobility of the TTC zone is important.

Guidance:
Safety in short-duration or mobile operations should not be compromised by using fewer devices simply because the operation will frequently change its location.

Option:
Appropriately colored or marked vehicles with high-intensity rotating, flashing, oscillating, or strobe lights may be used in place of signs and channelizing devices for short-duration or mobile operations. These vehicles may be augmented with signs or arrow panels.

Support:
During short-duration work, it often takes longer to set up and remove the TTC zone than to perform the work. Workers face hazards in setting up and taking down the TTC zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.
Considering these factors, simplified control procedures may be warranted for short-duration work. A reduction in the number of devices may be offset by the use of other more dominant devices such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles.

Mobile operations often involve frequent short stops for activities such as litter cleanup, pothole patching, or utility operations, and are similar to short-duration operations.

Warning signs, high-intensity rotating, flashing, oscillating, or strobe lights on a vehicle, flags, and/or channelizing devices should be used and moved periodically to keep them near the mobile work area.

Flaggers may be used for mobile operations that often involve frequent short stops.

Mobile operations also include work activities where workers and equipment move along the road without stopping, usually at slow speeds. The advance warning area moves with the work area.

When mobile operations are being performed, a shadow vehicle equipped with an arrow panel or a sign should follow the work vehicle, especially when vehicular traffic speeds or volumes are high. Where feasible, warning signs should be placed along the roadway and moved periodically as work progresses.

Under high-volume conditions, consideration should be given to scheduling mobile operations work during off-peak hours.

If there are mobile operations on a high-speed travel lane of a multi-lane divided highway, arrow panels should be used.

For mobile operations that move at speeds less than 5 km/h (3 mph), mobile signs or stationary signing that is periodically retrieved and repositioned in the advance warning area may be used.

At higher speeds, vehicles may be used as components of the TTC zones for mobile operations. Appropriately colored and marked vehicles with signs, flags, high-intensity rotating, flashing, oscillating, or strobe lights, truck-mounted attenuators, and arrow panels or portable changeable message signs may follow a train of moving work vehicles.

For some continuously moving operations, such as street sweeping and snow removal, a single work vehicle with appropriate warning devices on the vehicle may be used to provide warning to approaching road users.

Mobile operations that move at speeds greater than 30 km/h (20 mph), such as pavement marking operations, shall have appropriate devices on the equipment (that is, high-intensity rotating, flashing, oscillating, or strobe lights, signs, or special lighting), or shall use a separate vehicle with appropriate warning devices.
The choice of TTC needed for a TTC zone depends upon where the work is located. As a general rule, the closer the work is to road users (including bicyclists and pedestrians), the greater the number of TTC devices that are needed. Procedures are described later in this Chapter for establishing TTC zones in the following locations:

A. Outside the shoulder;
B. On the shoulder with no encroachment;
C. On the shoulder with minor encroachment;
D. Within the median; and
E. Within the traveled way.

Standard:

When the work space is within the traveled way, except for short-duration and mobile operations, advance warning shall provide a general message that work is taking place and shall supply information about highway conditions. TTC devices shall indicate how vehicular traffic can move through the TTC control zone.

Section 6G.04 Modifications To Fulfill Special Needs

Support:

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

The typical applications in Chapter 6H illustrate commonly encountered situations in which TTC devices are employed.

Option:

Other devices may be added to supplement the devices indicated in the typical applications, and device spacing may be adjusted to provide additional reaction time. When conditions are less complex than those depicted in the typical applications, fewer devices may be needed.

Guidance:

When conditions are more complex, typical applications should be modified by giving particular attention to the provisions set forth in Chapter 6B and by incorporating appropriate devices and practices from the following list:

A. Additional devices:
   1. Signs
   2. Arrow panels
   3. More channelizing devices at closer spacing (see Section 6F.68 for information regarding detectable edging for pedestrians)
   4. Temporary raised pavement markers
   5. High-level warning devices
   6. Portable changeable message signs
   7. Temporary traffic control signals (including pedestrian signals and accessible pedestrian signals)
   8. Temporary traffic barriers
   9. Crash cushions
   10. Screens
   11. Rumble strips
   12. More delineation

B. Upgrading of devices:
   1. A full complement of standard pavement markings
   2. Brighter and/or wider pavement markings
   3. Larger and/or brighter signs
   4. Channelizing devices with greater conspicuity
   5. Temporary traffic barriers in place of channelizing devices
C. Improved geometrics at detours or crossovers
D. Increased distances:
   1. Longer advance warning area
   2. Longer tapers
E. Lighting:
   1. Temporary roadway lighting
   2. Steady-burn lights used with channelizing devices
   3. Flashing lights for isolated hazards
   4. Illuminated signs
   5. Floodlights

Where pedestrian or bicycle usage is high, typical applications should also be modified by giving particular attention to the provisions set forth in Chapter 6D, Section 6F.68, and other Sections of Part 6 related to accessibility and detectability provisions in TTC zones.

Section 6G.05 Work Affecting Pedestrian and Bicycle Facilities

Support:

It is not uncommon, particularly in urban areas, that road work and the associated TTC will affect existing pedestrian or bicycle facilities. It is essential that the needs of all road users, including pedestrians with disabilities, are considered in TTC zones.

In addition to specific provisions identified in Sections 6G.06, 6G.07, 6G.08, 6G.10, 6G.11, 6G.12, and 6G.13, there are a number of provisions that might be applicable for all of the types of activities identified in this Chapter.

Guidance:

Where pedestrian or bicycle usage is high, the typical applications should be modified by giving particular attention to the provisions set forth in Chapters 6D and 6G, Section 6F.68, and in other Sections of Part 6 related to accessibility and detectability provisions in TTC zones.

Pedestrians should be separated from the worksite by appropriate devices that maintain the accessibility and detectability for pedestrians with disabilities.

Bicyclists and pedestrians should not be exposed to unprotected excavations, open utility access, overhanging equipment, or other such conditions.

Except for short duration and mobile operations, when a highway shoulder is occupied, a SHOULDER WORK sign should be placed in advance of the activity area. When work is performed on a paved shoulder 2.4 m (8 ft) or more in width, channelizing devices should be placed on a taper having a length that conforms to the requirements of a shoulder taper. Signs should be placed such that they do not narrow any existing pedestrian passages to less than 1200 mm (48 in).

Pedestrian detours should be avoided since pedestrians rarely observe them and the cost of providing accessibility and detectability might outweigh the cost of maintaining a continuous route. Whenever possible, work should be done in a manner that does not create a need to detour pedestrians from existing routes or crossings.

Standard:

Where pedestrian routes are closed, alternate pedestrian routes shall be provided.

When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.
Section 6G.06  Work Outside of Shoulder

Support:

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

When work is being performed off the roadway (beyond the shoulders, but within the right-of-way), little or no TTC might be needed. TTC generally is not needed where work is confined to an area 4.6 m (15 ft) or more from the edge of the traveled way. However, TTC is appropriate where distracting situations exist, such as vehicles parked on the shoulder, vehicles accessing the work site via the highway, and equipment traveling on or crossing the roadway to perform the work operations (for example, mowing). For work beyond the shoulder, see Figure 6H-1.

Guidance:

Where the above situations exist, a single warning sign, such as ROAD WORK AHEAD, should be used. If the equipment travels on the roadway, the equipment should be equipped with appropriate flags, high-intensity rotating, flashing, oscillating, or strobe lights, and/or a SLOW MOVING VEHICLE sign.

Option:

If work vehicles are on the shoulder, a SHOULDER WORK sign may be used. For mowing operations, the sign MOWING AHEAD may be used.

Where the activity is spread out over a distance of more than 3.2 km (2 mi), the SHOULDER WORK sign may be repeated every 1.6 km (1 mi).

A supplementary plaque with the message NEXT X MILES may be used.

Guidance:

A general warning sign like ROAD MACHINERY AHEAD should be used if workers and equipment must occasionally move onto the shoulder.

Section 6G.07  Work on the Shoulder with No Encroachment

Support:

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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

Standard:

When paved shoulders having a width of 2.4 m (8 ft) or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct motor vehicle traffic to remain within the traveled way.

Guidance:

When paved shoulders having a width of 2.4 m (8 ft) or more are closed on freeways and expressways, road users should be warned about potential disabled vehicles that cannot get off the traveled way. An initial general warning sign (such as ROAD WORK AHEAD) should be used, followed by a RIGHT or LEFT SHOULDER CLOSED sign. Where the end of the shoulder closure extends beyond the distance which can be perceived by road users, a supplementary plaque bearing the message NEXT X FEET or MILES should be placed below the SHOULDER CLOSED sign. On multi-lane, divided highways, signs advising of shoulder work or the condition of the shoulder should be placed only on the side of the affected shoulder.

When an improved shoulder is closed on a high-speed roadway, it should be treated as a closure of a portion of the road system because road users expect to be able to use it in emergencies. Road users should be given ample advance warning that shoulders are closed for use as refuge areas throughout a specified...
length of the approaching TTC zone. The sign(s) should read SHOULDER CLOSED with distances indicated. The work space on the shoulder should be closed off by a taper or channelizing devices with a length of 0.33 L using the formulas in Table 6C-3.

When the shoulder is not occupied but work has adversely affected its condition, the LOW SHOULDER or SOFT SHOULDER sign should be used, as appropriate.

Where the condition extends over a distance in excess of 1.6 km (1 mi), the sign should be repeated at 1.6 km (1 mi) intervals.

Option:

In addition, a supplementary plaque bearing the message NEXT X MILES may be used. Temporary traffic barriers may be needed to inhibit encroachment of errant vehicles into the work space and to protect workers.

**Standard:**

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

**Support:**

A typical application for stationary work operations on shoulders is shown in Figure 6H-3. Short duration or mobile work on shoulders is shown in Figure 6H-4. Work on freeway shoulders is shown in Figure 6H-5.

**Section 6G.08 Work on the Shoulder with Minor Encroachment**

**Support:**

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

**Guidance:**

When work takes up part of a lane, vehicular traffic volumes, vehicle mix (buses, trucks, cars, and bicycles), speed, and capacity should be analyzed to determine whether the affected lane should be closed. Unless the lane encroachment permits a remaining lane width of 3 m (10 ft), the lane should be closed.

Truck off-tracking should be considered when determining whether the minimum lane width of 3 m (10 ft) is adequate.

**Option:**

A lane width of 2.7 m (9 ft) may be used for short-term stationary work on low-volume, low-speed roadways when vehicular traffic does not include longer and wider heavy commercial vehicles.

**Support:**

Figure 6H-6 illustrates a method for handling vehicular traffic where the stationary or short duration work space encroaches slightly into the traveled way.

**Section 6G.09 Work Within the Median**

**Support:**

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

**Guidance:**

If work in the median of a divided highway is within 4.6 m (15 ft) from the edge of the traveled way for either direction of travel, TTC should be used through the use of advance warning signs and channelizing devices.
Section 6G.10  Work Within the Traveled Way of Two-Lane Highways

Support:

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

Detour signs are used to direct road users onto another roadway. At diversions, road users are directed onto a temporary roadway or alignment placed within or adjacent to the right-of-way. Typical applications for detouring or diverting road users on two-lane highways are shown in Figures 6H-7, 6H-8, and 6H-9. Figure 6H-7 illustrates the controls around an area where a section of roadway has been closed and a diversion has been constructed. Channelizing devices and pavement markings are used to indicate the transition to the temporary roadway.

Guidance:

When a detour is long, Detour (M4-8, M4-9) signs should be installed to remind and reassure road users periodically that they are still successfully following the detour.

When an entire roadway is closed, as illustrated in Figure 6H-8, a detour should be provided and road users should be warned in advance of the closure, which in this example is a closure 16 km (10 mi) from the intersection. If local road users are allowed to use the roadway up to the closure, the ROAD CLOSED AHEAD, LOCAL TRAFFIC ONLY sign should be used. The portion of the road open to local road users should have adequate signing, marking, and delineation.

Detours should be signed so that road users will be able to traverse the entire detour route and back to the original roadway as shown in Figure 6H-9.

Support:

Techniques for controlling vehicular traffic under one-lane, two-way conditions are described in Section 6C.10.

Option:

Flaggers may be used as shown in Figure 6H-10.

STOP/YIELD sign control may be used on roads with low traffic volumes as shown in Figure 6H-11.

A temporary traffic control signal may be used as shown in Figure 6H-12.

Section 6G.11  Work Within the Traveled Way of Urban Streets

Support:

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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

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

Standard:

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

If the TTC zone affects the movement of bicyclists, adequate access to the roadway or shared-use paths shall be provided (see Part 9).
Where transit stops are affected or relocated because of work activity, access to temporary transit stops shall be provided.

Guidance:

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

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

Support:

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

Standard:

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

Guidance:

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

Support:

Figures 6H-6, 6H-10, 6H-15, 6H-18, 6H-21, 6H-22, 6H-23, 6H-26, and 6H-33 are examples of typical applications for utility operations. Other typical applications might apply as well.

Section 6G.12 Work Within the Traveled Way of Multi-lane, Nonaccess Controlled Highways

Support:

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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

Standard:

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

Guidance:

When justified by an engineering study, temporary traffic barriers should be used to prevent incursions of errant vehicles into hazardous areas or work space.

Standard:

When temporary traffic barriers are placed immediately adjacent to the traveled way, they shall be equipped with appropriate channelizing devices, delineation, and/or other TTC devices. For lane closures, the merging taper shall use channelizing devices and the temporary traffic barrier shall be placed beyond the transition area.
Support:

It must be recognized that although temporary traffic barriers are shown in several of the typical applications of Chapter 6H, they are not considered to be TTC devices in themselves.

Figure 6H-34 illustrates a lane closure in which temporary traffic barriers are used.

Option:

When the right lane is closed, TTC similar to that shown in Figure 6H-33 may be used for undivided or divided four-lane roads.

Guidance:

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

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

Option:

When closing a left lane on a multi-lane undivided road, as vehicular traffic flow permits, the two interior lanes may be closed, as shown in Figure 6H-30, to provide drivers and workers additional lateral clearance and to provide access to the work space.

Standard:

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

Guidance:

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

When multiple lanes in one direction are closed, a capacity analysis should be made to determine the number of lanes needed to accommodate motor vehicle traffic needs. Vehicular traffic should be moved over one lane at a time. As shown in Figure 6H-37, the tapers should be separated by a distance of 2L, with L being determined by the formulas in Table 6C-3.

Standard:

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

Option:

When half the road is closed on an undivided highway, both directions of vehicular traffic may be accommodated as shown in Figure 6H-32. When both interior lanes are closed, temporary traffic controls may be used as indicated in Figure 6H-30. When a roadway must be closed on a divided highway, a median crossover may be used (see Section 6G.16).

Support:

TTC for lane closures on five-lane roads is similar to other multi-lane undivided roads. Figure 6H-32 can be adapted for use on five-lane roads. Figure 6H-35 can be used on a five-lane road for short duration and mobile operations.
Section 6G.13  Work Within the Traveled Way at an Intersection

Support:

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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

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

Guidance:

The effect of the work upon signal operation should be considered, such as signal phasing for ensuring adequate capacity, maintaining or adjusting signal detectors, and ensuring the appropriate visibility of signal heads.

Standard:

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

Guidance:

For work at an intersection, advance warning signs, devices, and markings should be used on all cross streets, as appropriate. The typical applications depict urban intersections on arterial streets. Where the posted speed limit, the off-peak 85th-percentile speed prior to the work starting, or the anticipated speed exceeds 60 km/h (40 mph), additional warning signs should be used in the advance warning area.

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

Support:

Near-side work spaces, as depicted in Figure 6H-21, are simply handled as a midblock lane closure. A problem that might occur with near-side lane closure is a reduction in capacity, which during certain hours of operation could result in congestion and backups.

Option:

When near-side work spaces are used, an exclusive turn lane may be used for through vehicular traffic.

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

Support:

Far-side work spaces, as depicted in Figures 6H-22 through 6H-25, involve additional treatment because road users typically enter the activity area by straight-through and left- or right-turning movements.

Guidance:

When a lane through an intersection must be closed on the far side, it should also be closed on the near-side approach to preclude merging movements within the intersection.
Option:

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

Support:

Figures 6H-26 and 6H-27 provide guidance on applicable procedures for work performed within the intersection.

Option:

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

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

Guidance:

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

Section 6G.14 Work Within the Traveled Way of Freeways and Expressways

Support:

Problems of TTC might occur under the special conditions encountered where vehicular traffic must be moved through or around TTC zones on high-speed, high-volume roadways. Although the general principles outlined in the previous Sections of this Manual are applicable to all types of highways, high-speed, access-controlled highways need special attention in order to reasonably safely and efficiently accommodate vehicular traffic while also protecting work forces. The road user volumes, road vehicle mix (buses, trucks, cars, and bicycles, if permitted), and speed of vehicles on these facilities require that careful TTC procedures be implemented, for example, to induce critical merging maneuvers well in advance of work spaces and in a manner that creates minimum turbulence and delay in the vehicular traffic stream. These situations often require more conspicuous devices than specified for normal rural highway or urban street use. However, the same important basic considerations of uniformity and standardization of general principles apply for all roadways.

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

TTC for a typical lane closure on a divided highway is shown in Figure 6H-33. Temporary traffic controls for short duration and mobile operations on freeways are shown in Figure 6H-35. A typical application for shifting vehicular traffic lanes around a work space is shown in Figure 6H-36 TTC for multiple and interior lane closures on a freeway is shown in Figures 6H-37 and 6H-38.

Guidance:

The method for closing an interior lane when the open lanes have the capacity to carry vehicular traffic should be as shown in Figure 6H-37. When the capacity of the other lanes is needed, the method shown in Figure 6H-38 should be used.
Section 6G.15 Two-Lane, Two-Way Traffic on One Roadway of a Normally Divided Highway

Support:

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

Standard:

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

Support:

Figure 6H-39 shows the procedure for two-lane, two-way operation. Treatments for entrance and exit ramps within the two-way roadway segment of this type of work are shown in Figures 6H-40 and 6H-41.

Section 6G.16 Crossovers

Guidance:

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

A. Tapers for lane drops should be separated from the crossovers, as shown in Figure 6H-39.
B. Crossovers should be designed for speeds no lower than 16 km/h (10 mph) below the posted speed, the off-peak 85th-percentile speed prior to the work starting, or the anticipated operating speed of the roadway, unless unusual site conditions require that a lower design speed be used.
C. A good array of channelizing devices, delineators, and full-length, properly placed pavement markings should be used to provide drivers with a clearly defined travel path.
D. The design of the crossover should accommodate all vehicular traffic, including trucks and buses.

Support:

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

Section 6G.17 Interchanges

Guidance:

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

Option:

If access is not possible, ramps may be closed by using signs and Type III barricades. As the work space changes, the access area may be changed, as shown in Figure 6H-42. A TTC zone in the exit ramp may be handled as shown in Figure 6H-43.

When a work space interferes with an entrance ramp, a lane may need to be closed on the freeway (see Figure 6H-44). A TTC zone in the entrance ramp may require shifting ramp vehicular traffic (see Figure 6H-44).
Section 6G.18 **Movable Barriers**

Support:

Figure 6H-45 shows a temporary reversible lane using movable barriers.

Option:

If the work activity in Figure 6H-34 permits, a movable barrier may be used and relocated to the shoulder during nonwork periods or peak-period vehicular traffic conditions.

Section 6G.19 **Work in the Vicinity of Highway-Rail Grade Crossings**

**Standard:**

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

Support:

Figure 6H-46 shows work in the vicinity of a highway-rail grade crossing.

**Guidance:**

Early coordination with the railroad company should occur before work starts.

Section 6G.20 **Temporary Traffic Control During Nighttime Hours**

Support:

Chapter 6D and Sections 6F.68 and 6G.05 contain additional information regarding the steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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

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

Although working at night might offer advantages, it also includes safety issues. Reduced visibility inherent in night work impacts the performance of both drivers and workers. Because traffic volumes are lower and congestion is minimized, speeds are often higher at night necessitating greater visibility at a time when visibility is reduced. Finally, the incidence of impaired (alcohol or drugs), fatigued, or drowsy drivers might be higher at night.

Working at night also involves other factors, including construction productivity and quality, social impacts, economics, and environmental issues. A decision to perform construction or maintenance activities at night normally involves some consideration of the advantages to be gained compared to the safety and other issues that might be impacted.
Guidance:

Considering the safety issues inherent to night work, consideration should be given to enhancing traffic controls (see Section 6G.04) to provide added visibility and driver guidance, and increased protection for workers.

In addition to the enhancements listed in Section 6G.04, consideration should be given to providing additional lights and retroreflective markings to workers, work vehicles, and equipment.

Option:

Where reduced traffic volumes at night make it feasible, the entire roadway may be closed by detouring traffic to alternate facilities, thus removing the traffic risk from the activity area.

Guidance:

Because typical street and highway lighting is rarely adequate to provide sufficient levels of illumination for work tasks, temporary lighting should be provided where workers are active to supply sufficient illumination to reasonably safely perform the work tasks.

Temporary lighting for night work should be designed such that glare does not interfere with driver visibility, or create visibility problems for truck drivers, equipment operators, flaggers, or other workers.

Consideration should also be given to stationing uniformed law enforcement officers and lighted patrol cars at night work locations where there is a concern that high speeds or impaired drivers might result in undue risks for workers or other drivers.

Standard:

Except in emergencies, temporary lighting shall be provided at all flagger stations.

Support:

Desired illumination levels vary depending upon the nature of the task involved. An average horizontal luminance of 50 lux (5 foot candles) can be adequate for general activities. An average horizontal luminance of 108 lux (10 foot candles) can be adequate for activities around equipment. Tasks requiring high levels of precision and extreme care can require an average horizontal luminance of 216 lux (20 foot candles).
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CHAPTER 6H. TYPICAL APPLICATIONS

Section 6H.01 Typical Applications

Support:

Whenever the acronym “TTC” is used in this Chapter, it refers to “temporary traffic control.”

Standard:

The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:

Chapter 6G contains discussions of typical TTC activities. Chapter 6H presents typical applications for a variety of situations commonly encountered. While not every situation is addressed, the information illustrated can generally be adapted to a broad range of conditions. In many instances, an appropriate TTC plan is achieved by combining features from various typical applications. For example, work at an intersection might present a near-side work zone for one street and a far-side work zone for the other street. These treatments are found in two different typical applications, while a third typical application shows how to handle pedestrian crosswalk closures. For convenience in using the typical application diagrams, Tables 6C-1 and 6C-4 are reproduced in this Chapter as Tables 6H-3 and 6H-4, respectively.

Procedures for establishing TTC zones vary with such conditions as road configuration, location of the work, work activity, duration of work, road user volumes, road vehicle mix (buses, trucks, cars, motorcycles, and bicycles), and road user speeds. Examples are presented in this Chapter showing how to apply principles and standards. Applying these guidelines to actual situations and adjusting to field conditions requires judgment. In general, the procedures illustrated represent minimum solutions for the situations depicted.

Option:

Other devices may be added to supplement the devices and device spacing may be adjusted to provide additional reaction time or delineation. Fewer devices may be used based on field conditions.

Support:

Figures and tables found throughout Part 6 provide information for the development of TTC plans. Also, Table 6H-3 is used for the determination of sign spacing and other dimensions for various area and roadway types.

Table 6H-1 is an index of the 46 typical applications. Typical applications are shown on the right page with notes on the facing page to the left. The legend for the symbols used in the typical applications is provided in Table 6H-2. In many of the typical applications, sign spacings and other dimensions are indicated by letters using the criteria provided in Table 6H-3. The formulas for determining taper lengths are provided in Table 6H-4.

Most of the typical applications show TTC devices for only one direction.
### Table 6H-1. Index to Typical Applications (Sheet 1 of 2)

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<th>Typical Application Number</th>
</tr>
</thead>
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<td>Blasting Zone</td>
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<td>Overlapping Routes with Detour</td>
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<td>Lane Closure on Two-Lane Road Using Flaggers</td>
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<td>Lane Closure on Two-Lane Road with Low Traffic Volumes</td>
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<td>Surveying Along Centerline of Road with Low Traffic Volumes</td>
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<td>Mobile Operations on Two-Lane Road</td>
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<td>Detour for One Travel Direction</td>
<td>TA-19</td>
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<td>Right Lane Closure on Far Side of Intersection</td>
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<td>Left Lane Closure on Far Side on Intersection</td>
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<tr>
<td>Half Road closure on Far Side of Intersection</td>
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<td>Multiple Lane Closures at Intersection</td>
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<td>Closure in Center of Intersection</td>
<td>TA-26</td>
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<tr>
<td>Closure at Side of Intersection</td>
<td>TA-27</td>
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<tr>
<td>Sidewalk Closures and Bypass Sidewalks</td>
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<td>Crosswalk Closures and Pedestrian Detours</td>
<td>TA-29</td>
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<tr>
<td>Work Within the Traveled Way of Multilane Undivided Highways (see Section 6G.12)</td>
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<td>Interior Lane Closure on Multi-lane Street</td>
<td>TA-30</td>
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<tr>
<td>Lane Closure on Street with Uneven Directional Volume</td>
<td>TA-31</td>
</tr>
<tr>
<td>Half Road Closure on Multi-lane, High-Speed Highway</td>
<td>TA-32</td>
</tr>
<tr>
<td>Lane Closure on Divided Highway</td>
<td>TA-33</td>
</tr>
<tr>
<td>Lane Closure with Temporary Traffic Barrier</td>
<td>TA-34</td>
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<tr>
<td>Mobile Operation on Multi-lane Road</td>
<td>TA-35</td>
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<tr>
<td>Work Within the Traveled Way of Freeways and Expressways (see Section 6G.14)</td>
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<tr>
<td>Lane Shift on Freeway</td>
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<tr>
<td>Double Lane Closure on Freeway</td>
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<tr>
<td>Interior Lane Closure on Freeway</td>
<td>TA-38</td>
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<td>Median Crossover on Freeway</td>
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<td>Median Crossover for Entrance Ramp</td>
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<tr>
<td>Median Crossover for Exit Ramp</td>
<td>TA-41</td>
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<tr>
<td>Work in Vicinity of Exit Ramp</td>
<td>TA-42</td>
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<tr>
<td>Partial Exit Ramp Closure</td>
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<tr>
<td>Work in Vicinity of Entrance Ramp</td>
<td>TA-44</td>
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<tr>
<td>Temporary Reversible Lane Using Movable Barriers</td>
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<tr>
<td>Work in the Vicinity of Highway-Rail Grade Crossings (see Section 6G.19)</td>
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<td><img src="image" alt="Arrow panel" /></td>
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</tr>
<tr>
<td><img src="image" alt="Arrow panel support or trailer" /></td>
<td>Arrow panel support or trailer (shown facing down)</td>
</tr>
<tr>
<td><img src="image" alt="Changeable message sign or support trailer" /></td>
<td>Changeable message sign or support trailer</td>
</tr>
<tr>
<td><img src="image" alt="Channelizing device" /></td>
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<td><img src="image" alt="Direction of traffic" /></td>
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<tr>
<td><img src="image" alt="Flagger" /></td>
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</tr>
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<td><img src="image" alt="High-level warning device (Flag tree)" /></td>
<td>High-level warning device (Flag tree)</td>
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<td><img src="image" alt="Luminaire" /></td>
<td>Luminaire</td>
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<td><img src="image" alt="Pavement markings that should be removed for a long-term project" /></td>
<td>Pavement markings that should be removed for a long-term project</td>
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<td><img src="image" alt="Sign (shown facing left)" /></td>
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<tr>
<td><img src="image" alt="Temporary barrier with warning lights" /></td>
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</tr>
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<td><img src="image" alt="Traffic or Pedestrian signal" /></td>
<td>Traffic or Pedestrian signal</td>
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<td><img src="image" alt="Truck-mounted attenuator" /></td>
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<td><img src="image" alt="Type III Barricade" /></td>
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<td><img src="image" alt="Work vehicle" /></td>
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**Table 6H-2. Meaning of Symbols on Typical Application Diagrams**
Table 6H-3. Meaning of Letter Codes on Typical Application Diagrams

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Distance Between Signs **</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Urban (low speed) *</td>
<td>30 (100)</td>
</tr>
<tr>
<td>Urban (high speed) *</td>
<td>100 (350)</td>
</tr>
<tr>
<td>Rural</td>
<td>150 (500)</td>
</tr>
<tr>
<td>Expressway / Freeway</td>
<td>300 (1,000)</td>
</tr>
</tbody>
</table>

* Speed category to be determined by highway agency.

** Distances are shown in meters (feet). The column headings A, B, and C are the dimensions shown in Figures 6H-1 through 6H-46. The A dimension is the distance from the transition or point of restriction to the first sign. The B dimension is the distance between the first and second signs. The C dimension is the distance between the second and third signs. (The third sign is the first one in a three-sign series encountered by a driver approaching a TTC zone.)

Table 6H-4. Formulas for Determining Taper Lengths

<table>
<thead>
<tr>
<th>Speed Limit (S)</th>
<th>Taper Length (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Meters</td>
</tr>
<tr>
<td>60 km/h or less</td>
<td>$L = \frac{WS^2}{155}$</td>
</tr>
<tr>
<td>70 km/h or more</td>
<td>$L = \frac{WS}{1.6}$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed Limit (S)</th>
<th>Taper Length (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Feet</td>
</tr>
<tr>
<td>40 mph or less</td>
<td>$L = \frac{WS^2}{60}$</td>
</tr>
<tr>
<td>45 mph or more</td>
<td>$L = WS$</td>
</tr>
</tbody>
</table>

Where: $L =$ taper length in meters (feet)  
$W =$ width of offset in meters (feet)  
$S =$ posted speed limit, of off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in km/h (mph)
Notes for Figure 6H-1—Typical Application 1
Work Beyond the Shoulder

Guidance:

1. If the work space is in the median of a divided highway, an advance warning sign should also be placed on the left side of the directional roadway.

Option:

2. The ROAD WORK AHEAD sign may be replaced with other appropriate signs such as the SHOULDER WORK sign. The SHOULDER WORK sign may be used for work adjacent to the shoulder.

3. The ROAD WORK AHEAD sign may be omitted where the work space is behind a barrier, more than 600 mm (24 in) behind the curb, or 4.6 m (15 ft) or more from the edge of any roadway.

4. For short-term, short-duration or mobile operation, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.

5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

6. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-1. Work Beyond the Shoulder (TA-1)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 1
Notes for Figure 6H-2—Typical Application 2
Blasting Zone

Standard:

1. Whenever blasting caps are used within 300 m (1,000 ft) of a roadway, the signing shown shall be used.

2. The signs shall be covered or removed when there are no explosives in the area or the area is otherwise secure.

3. Whenever a side road intersects the roadway between the BLASTING ZONE AHEAD sign and the END BLASTING ZONE sign, or a side road is within 300 m (1,000 ft) of any blasting cap, similar signing, as on the mainline, shall be installed on the side road.

4. Prior to blasting, the blaster in charge shall determine whether road users in the blasting zone will be endangered by the blasting operation. If there is danger, road users shall not be permitted to pass through the blasting zone during blasting operations.

Guidance:

5. On a divided highway, the signs should be mounted on both sides of the directional roadways.
Figure 6H-2. Blasting Zone (TA-2)

Note: \( C \) = Blasting Cap

See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-3—Typical Application 3
Work on Shoulders

Guidance:

1. A SHOULDER WORK sign should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.

Option:

2. The Workers symbol signs may be used instead of SHOULDER WORK signs.

3. The SHOULDER WORK AHEAD sign on an intersecting roadway may be omitted where drivers emerging from that roadway will encounter another advance warning sign prior to this activity area.

4. For short-duration operations of 60 minutes or less, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.

5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

6. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.

7. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.
Figure 6H-3. Work on Shoulders (TA-3)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 3

OMUTCD - English units are preferred.
Notes for Figure 6H-4—Typical Application 4
Short-Duration or Mobile Operation on Shoulder

Guidance:

1. In those situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 8 km (5 mi).

2. In those situations where the distance between the advance signs and the work is 3.2 km (2 mi) to 8 km (5 mi), a Supplemental Distance plaque should be used with the ROAD WORK AHEAD sign.

Option:

3. The ROAD WORK NEXT XX MILES sign may be used instead of the ROAD WORK AHEAD sign if the work locations occur over a distance of more than 3.2 km (2 mi).

4. Warning signs may be omitted when the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights if the distance between work locations is 1.6 km (1 mile) or more, and if the work vehicle travels at vehicular traffic speeds between locations.

5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

6. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.

7. If an arrow panel is used for an operation on the shoulder, the caution mode shall be used.
Figure 6H-4. Short-Duration or Mobile Operation on Shoulder (TA-4)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-5—Typical Application 5
Shoulder Closure on Freeway

Guidance:

1. SHOULDER CLOSED signs should be used on limited-access highways where there is no opportunity for disabled vehicles to pull off the roadway.
2. If drivers cannot see a pull-off area beyond the closed shoulder, information regarding the length of the shoulder closure should be provided in meters or kilometers (feet or miles), as appropriate.
3. The use of a temporary traffic barrier should be based on engineering judgment.

Standard:

4. Where temporary traffic barriers are installed, the ends of the barrier shall be treated in accordance with the provisions of Section 6F.81.

Option:

5. The barrier shown in this typical application is an example of one method that may be used to close a shoulder of a long-term project.
6. The warning lights shown on the barrier may be used.
Figure 6H-5. Shoulder Closure on Freeway (TA-5)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 5
Notes for Figure 6H-6—Typical Application 6
Shoulder Work with Minor Encroachment

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.
2. The treatment shown should be used on a minor road having low speeds. For higher-speed traffic conditions, a lane closure should be used.

Option:

3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.
4. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely spaced channelizing devices, provided that the minimum lane width of 3 m (10 ft) is maintained.
5. Additional advance warning may be appropriate, such as a ROAD NARROWS sign.
6. Temporary traffic barriers may be used along the work space.
7. The shadow vehicle may be omitted if a taper and channelizing devices are used.
8. A truck-mounted attenuator may be used on the shadow vehicle.
9. For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

11. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-6. Shoulder Work with Minor Encroachment (TA-6)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

OMUTCD - English units are preferred.
Notes for Figure 6H-7—Typical Application 7
Road Closure with Diversion

Support:
1. Signs and object markers are shown for one direction of travel only.

Standard:
2. Devices similar to those depicted shall be placed for the opposite direction of travel.
3. Pavement markings no longer applicable shall be removed or obliterated as soon as practicable.
4. Temporary barriers and end treatments shall be crashworthy.

Guidance:
5. If the tangent distance along the temporary diversion is more than 180 m (600 ft), a Reverse Curve sign, left first, should be used instead of the Double Reverse Curve sign, and a second Reverse Curve sign, right first, should be placed in advance of the second reverse curve back to the original alignment.
6. When the tangent section of the diversion is more than 180 m (600 ft), and the diversion has sharp curves with recommended speeds of 50 km/h (30 mph) or less, Reverse Turn signs should be used.
7. Where the temporary pavement and old pavement are different colors, the temporary pavement should start on the tangent of the existing pavement and end on the tangent of the existing pavement.

Option:
8. Flashing warning lights and/or flags may be used to call attention to the warning signs.
9. On sharp curves, large arrow signs may be used in addition to other advance warning signs.
10. Delineators or channelizing devices may be used along the diversion.

OMUTCD - English units are preferred.
Figure 6H-7. Road Closure with Diversion (TA-7)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-8—Typical Application 8
Road Closure with Off-Site Detour

Guidance:

1. Regulatory traffic control devices should be modified as needed for the duration of the detour.

2. If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection, the ROAD CLOSED and DETOUR signs on Type III Barricades should be located at the edge of the traveled way.

Option:

3. If the road is closed a short distance beyond the intersection and there are few origin/destination points beyond (for example, a few residences), the Type III Barricade shown in the figure may be moved to the center of the traveled lanes.

Standard:

4. If the barricades are located as in Item 3 above, the ROAD CLOSED and DETOUR signs shall be placed only on the barricade centered in the lane of travel of traffic approaching the closure. The barricade centered in the lane of travel of departing traffic shall not be signed. The barricades in adjacent lanes shall be offset longitudinally from each other an adequate distance in order to permit traffic to travel around the barricades (the barricade in the road user's lane located in advance of the barricade located left of the center line).

Option:

5. A Route Sign Directional assembly may be placed on the far left corner of the intersection to augment or replace the one shown on the near right corner.

6. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

7. Cardinal direction plaques may be used with route signs.
Figure 6H-8. Road Closure with Off-Site Detour (TA-8)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure. See Section 2D.11 and Figure 2D-3 for the correct design of an Ohio State Route sign.

Typical Application 8

OMUTCD - English units are preferred.
Notes for Figure 6H-9—Typical Application 9
Overlapping Routes with Detour

Support:

1. TTC devices are shown for one direction of travel only.

Standard:

2. Devices similar to those depicted shall be placed for the opposite direction of travel.

Guidance:

3. STOP signs displayed to side roads should be installed as needed along the temporary route.

Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Flashing warning lights may be used on the Type III Barricades.
6. Cardinal direction plaques may be used with route signs.
Figure 6H-9. Overlapping Routes with Detour (TA-9)

State Route 4

Type III Barricade

State Route 17

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this Figure. See Section 2D.11 and Figure 2D-3 for the correct design of an Ohio State Route sign.

Typical Application 9

OMUTCD - English units are preferred.
Notes for Figure 6H-10—Typical Application 10
Lane Closure on Two-Lane Road Using Flaggers

Option:

1. For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used (see Chapter 6E).

2. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations.

3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

4. The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.

Standard:

5. At night, flagger stations shall be illuminated, except in emergencies.

Guidance:

6. When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.

7. When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the transition area precedes the highway-rail grade crossing.

8. When a highway-rail grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.

9. When a highway-rail grade crossing exists within the activity area, drivers operating on the left side of the normal centerline should be provided with comparable warning devices as for drivers operating on the right side of the normal centerline.

10. Early coordination with the railroad company should occur before work starts.

Option:

11. A flagger or a uniformed law enforcement officer may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.
Figure 6H-10. Lane Closure on Two-Lane Road Using Flaggers (TA-10)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Note: The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.

Typical Application 10

OMUTCD - English units are preferred.
Notes for Figure 6H-11—Typical Application 11
Lane Closure on Two-Lane Road with Low Traffic Volumes

Option:

1. This TTC zone application may be used as an alternate to the TTC application shown in Figure 6H-10 (using flaggers) when the following conditions exist:
   a. Vehicular traffic volume is such that sufficient gaps exist for vehicular traffic that must yield.
   b. Road users from both directions are able to see approaching vehicular traffic through and beyond the work site and have sufficient visibility of approaching vehicles.

2. The Type B flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs whenever a night lane closure is necessary. For additional information on proper use of warning lights, see Section 6F-78.
Figure 6H-11. Lane Closure on Two-Lane Road with Low Traffic Volumes (TA-11)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 11
Notes for Figure 6H-12—Typical Application 12
Lane Closure on Two-Lane Road Using Traffic Control Signals

Standard:

1. TTC signals shall be installed and operated in accordance with the provisions of Part 4. TTC signals shall meet the physical display and operational requirements of conventional traffic control signals.

2. TTC signal timing shall be established by authorized officials. Durations of red clearance intervals shall be adequate to clear the one-lane section of conflicting vehicles.

3. When the TTC signal is changed to the flashing mode, either manually or automatically, red signal indications shall be flashed to both approaches.

4. Stop lines shall be installed with TTC signals for intermediate and long-term closures. Existing conflicting pavement markings and raised pavement marker reflectors between the activity area and the stop line shall be removed. After the TTC signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.

5. Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.

Guidance:

6. Where no-passing lines are not already in place, they should be added.

7. Adjustments in the location of the advance warning signs should be made as needed to accommodate the horizontal or vertical alignment of the roadway, recognizing that the distances shown for sign spacings are minimums. Adjustments in the height of the signal heads should be made as needed to conform to the vertical alignment.

Option:

8. Flashing warning lights shown on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs may be used.

9. Removable pavement markings may be used.

Support:

10. TTC signals are preferable to flaggers for long-term projects and other activities that would require flagging at night.

11. The maximum length of activity area for one-way operation under TTC signal control is determined by the capacity required to handle the peak demand.
Figure 6H-12. Lane Closure on Two-Lane Road Using Traffic Control Signals (TA-12)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 12

OMUTCD - English units are preferred.
Notes for Figure 6H-13—Typical Application 13
Temporary Road Closure

Support:
1. Conditions represented are a planned closure not exceeding 20 minutes during the daytime.

Standard:
2. A flagger or uniformed law enforcement officer shall be used for this application. The flagger, if used for this application, shall follow the procedures noted in Sections 6E.04 and 6E.05.

Guidance:
3. The uniformed law enforcement officer, if used for this application, should follow the procedures noted in Sections 6E.04 and 6E.05.

Option:
4. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:
5. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.
Figure 6H-13. Temporary Road Closure (TA-13)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-14—Typical Application 14
Haul Road Crossing

Guidance:
1. Floodlights should be used to illuminate haul road crossings where existing light is inadequate.
2. Where no-passing lines are not already in place, they should be added.

Standard:
3. The traffic control method selected shall be used in both directions.

Flagging Method
4. When a road used exclusively as a haul road is not in use, the haul road shall be closed with Type III barricades and the Flagger symbol signs covered.
5. The flagger shall follow the procedures noted in Sections 6E.04 and 6E.05.
6. At night, flagger stations shall be illuminated, except in emergencies.

Signalized Method
7. When a road used exclusively as a haul road is not in use, Type III barricades shall be in place. The signals shall either flash yellow on the main road or be covered, and the Signal Ahead and STOP HERE ON RED signs shall be covered or hidden from view.
8. The TTC signals shall control both the highway and the haul road and shall meet the physical display and operational requirements of conventional traffic control signals as described in Part 4. Traffic control signal timing shall be established by authorized officials.
9. Stop lines shall be used on existing highway with TTC signals.
10. Existing conflicting pavements markings between the stop lines shall be removed. After the TTC signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.
Figure 6H-14. Haul Road Crossing (TA-14)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-15—Typical Application 15
Work in Center of Road with Low Traffic Volumes

Guidance:

1. The lanes on either side of the center work space should have a minimum width of 3 m (10 ft) as measured from the near edge of the channelizing devices to the edge of pavement or the outside edge of paved shoulder.

2. Workers in the roadway should wear high-visibility safety apparel as described in Section 6D.03.

Option:

3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

4. If the closure continues overnight, warning lights may be used on the channelizing devices.

5. A lane width of 2.7 m (9 ft) may be used for short-term stationary work on low-volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.

6. A work vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights may be used instead of the channelizing devices forming the tapers or the high-level warning devices.

7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

8. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-15. Work in Center of Road with Low Traffic Volumes (TA-15)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-16—Typical Application 16
Surveying Along Centerline of Road with Low Traffic Volumes

Guidance:

1. Cones should be placed 150 mm (6 in) to 300 mm (12 in) on either side of the centerline.

2. When using metric units, spacing of channelizing devices should not exceed a distance in meters equal to 1/5 of the speed limit (km/h) when used for taper channelization and a distance in meters equal to 2/5 of the speed limit (km/h) when used for tangent channelization. When using English units, spacing of channelizing devices should not exceed a distance in feet equal to the speed limit (mph) when used for the taper channelization and a distance in feet of 2 times the speed limit (mph) when used for tangent channelization.

3. A flagger should be used to warn workers who cannot watch road users.

4. Workers in the roadway should wear high-visibility safety apparel as described in Section 6D.03.

Standard:

5. For surveying on the centerline of a high-volume road, one lane shall be closed using the information illustrated in Figure 6H-10.

Option:

6. A high-level warning device may be used to protect a surveying device, such as a target on a tripod.

7. Cones may be omitted for a cross-section survey.

8. ROAD WORK AHEAD signs may be used in place of the SURVEY CREW AHEAD signs.

9. Flags may be used to call attention to the advance warning signs.

10. If the work is along the shoulder, the flagger may be omitted.

11. For a survey along the edge of the road or along the shoulder, cones may be placed along the edge line.

12. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

13. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.
Figure 6H-16. Surveying Along Centerline of Road with Low Traffic Volumes (TA-16)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

OMUTCD - English units are preferred.
Notes for Figure 6H-17—Typical Application 17
Mobile Operations on Two-Lane Road

Standard:

1. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.

2. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.

3. If an arrow panel is used, it shall be used in the caution mode.

Guidance:

4. Where practical and when needed, the work and shadow vehicles should pull over periodically to allow vehicular traffic to pass.

5. Whenever adequate stopping sight distance exists to the rear, the shadow vehicle should maintain the minimum distance from the work vehicle and proceed at the same speed. The shadow vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance.

6. The shadow vehicles should also be equipped with two high-intensity flashing lights mounted on the rear, adjacent to the sign.

Option:

7. The distance between the work and shadow vehicles may vary according to terrain, paint drying time, and other factors.

8. Additional shadow vehicles to warn and reduce the speed of oncoming or opposing vehicular traffic may be used. Law enforcement vehicles may be used for this purpose.

9. A truck-mounted attenuator may be used on the shadow vehicle or on the work vehicle.

10. If the work and shadow vehicles cannot pull over to allow vehicular traffic to pass frequently, a DO NOT PASS sign may be placed on the rear of the vehicle blocking the lane.

Support:

11. Shadow vehicles are used to warn motor vehicle traffic of the operation ahead.

Standard:

12. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-17. Mobile Operations on Two-Lane Road (TA-17)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 17

OMUTCD - English units are preferred.
Notes for Figure 6H-18—Typical Application 18
Lane Closure on Minor Street

Standard:
1. This TTC shall be used only for low-speed facilities having low traffic volumes.

Option:
2. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

Standard:
3. Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in Figure 6H-10.

Option:
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.
Figure 6H-18. Lane Closure on Minor Street (TA-18)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 18
Notes for Figure 6H-19—Typical Application 19
Detour for One Travel Direction

Guidance:
1. This plan should be used for streets without posted route numbers.
2. On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.

Option:
3. The STREET CLOSED legend may be used in place of ROAD CLOSED.
4. Additional DO NOT ENTER signs may be used at intersections with intervening streets.
5. Warning lights may be used on Type III Barricades.
6. Detour signs may be located on the far side of intersections.
7. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

Standard:
8. When used, the Street Name sign shall be placed above the Detour sign.
Figure 6H-19. Detour for One Travel Direction (TA-19)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-20—Typical Application 20
Detour for Closed Street

Guidance:

1. This plan should be used for streets without posted route numbers.
2. On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.

Option:

3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. Flashing warning lights may be used on Type III Barricades.
5. Detour signs may be located on the far side of intersections. A Detour sign with an advance arrow may be used in advance of a turn.
6. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

Standard:

7. When used, the Street Name sign shall be placed above the Detour sign.

Support:

8. See Figure 6H-9 for the information for detouring a numbered highway.
Figure 6H-20. Detour for Closed Street (TA-20)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 20
Notes for Figure 6H-21—Typical Application 21
Lane Closure on Near Side of Intersection

Standard:
1. The merging taper shall direct vehicular traffic into either the right or left lane, but not both.

Guidance:
2. In this typical application, a left taper should be used so that right-turn movements will not impede through vehicular traffic. However, the reverse should be true for left-turn movements.
3. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

Option:
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A shadow vehicle with a truck-mounted attenuator may be used.
6. A work vehicle with high-intensity rotating, flashing, oscillating, or strobe lights may be used with the high-level warning device.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:
8. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-21. Lane Closure on Near Side of Intersection (TA-21)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-22—Typical Application 22
Right Lane Closure on Far Side of Intersection

Guidance:

1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

Option:

2. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right lane having significant right turning movements, then the right lane may be restricted to right turns only, as shown. This procedure increases the through capacity by eliminating right turns from the open through lane.

3. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

5. Where the turning radius is large, it may be possible to create a right-turn island using channelizing devices or pavement markings.
Figure 6H-22. Right Lane Closure on Far Side of Intersection (TA-22)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-23—Typical Application 23
Left Lane Closure on Far Side of Intersection

Guidance:

1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

Option:

2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a left lane having significant left-turning movements, then the left lane may be reopened as a turn bay for left turns only, as shown.

Support:

4. By first closing off the left lane and then reopening it as a turn bay, an island is created with channelizing devices that allows the LEFT LANE MUST TURN LEFT sign to be repeated on the left adjacent to the lane that it controls.
Figure 6H-23. Left Lane Closure on Far Side of Intersection (TA-23)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-24—Typical Application 24
Half Road Closure on Far Side of Intersection

Guidance:

1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

2. When turn prohibitions are implemented, two turn prohibition signs should be used, one on the near side and, space permitting, one on the far side of the intersection.

Option:

3. A buffer space may be used between opposing directions of vehicular traffic as shown in this application.

4. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, if there is a significant right-turning movement, then the right lane may be restricted to right turns only, as shown.

5. Where the turning radius is large, a right-turn island using channelizing devices or pavement markings may be used.

6. There may be insufficient space to place the back-to-back Keep Right sign and No Left Turn symbol signs at the end of the row of channelizing devices separating opposing vehicular traffic flows. In this situation, the No Left Turn symbol sign may be placed on the right and the Keep Right sign may be omitted.

7. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.

8. Flashing warning lights and/or flags may be used to call attention to advance warning signs.

9. Temporary pavement markings may be used to delineate the travel path through the intersection.

Support:

10. Keeping the right lane open increases the through capacity by eliminating right turns from the open through lane.

11. A temporary turn island reinforces the nature of the temporary exclusive right-turn lane and enables a second RIGHT LANE MUST TURN RIGHT sign to be placed in the island.
Figure 6H-24. Half Road Closure on Far Side of Intersection (TA-24)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 24

OMUTCD - English units are preferred.
Notes for Figure 6H-25—Typical Application 25
Multiple Lane Closures at Intersection

Guidance:

1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.

2. If the left through lane is closed on the near-side approach, the LEFT LANE MUST TURN LEFT sign should be placed in the median to discourage through vehicular traffic from entering the left-turn bay.

Option:

3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. If the left-turning movement that normally uses the closed turn bay is small and/or the gaps in opposing vehicular traffic are frequent, left turns may be permitted on that approach.

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
Figure 6H-25. Multiple Lane Closures at Intersection (TA-25)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 25
Notes for Figure 6H-26—Typical Application 26
Closure in Center of Intersection

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.

Option:

2. A high-level warning device may be placed in the work space, if there is sufficient room.
3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.
4. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
5. Unless the streets are wide, it may be physically impossible to turn left, especially for large vehicles. Left turns may be prohibited as required by geometric conditions.
6. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

8. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-26. Closure in Center of Intersection (TA-26)

Typical Application 26

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-27—Typical Application 27
Closure at Side of Intersection

Guidance:
1. The situation depicted can be simplified by closing one or more of the intersection approaches. If this cannot be done, and/or when capacity is a problem, through vehicular traffic should be directed to other roads or streets.
2. Depending on road user conditions, flagger(s) or uniformed law enforcement officer(s) should be used to direct road users within the intersection.

Standard:
3. At night, flagger stations shall be illuminated, except in emergencies.

Option:
4. ONE LANE ROAD AHEAD signs may also be used to provide adequate advance warning.
5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
6. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
7. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:
8. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

Support:
9. Turns can be prohibited as required by vehicular traffic conditions. Unless the streets are wide, it might be physically impossible to make certain turns, especially for large vehicles.

Option:
10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:
11. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Figure 6H-27. Closure at Side of Intersection (TA-27)

See Note 2 for flagger information.

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 27
Notes for Figure 6H-28—Typical Application 28
Sidewalk Closures and Bypass Sidewalks

Standard:

1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

Guidance:

2. Where high speeds are anticipated, a temporary traffic barrier and, if necessary, a crash cushion should be used to separate the temporary sidewalks from vehicular traffic.

3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.

Option:

4. Street lighting may be considered.

5. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.

6. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.

7. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the temporary sidewalks from vehicular traffic flow.

8. Signs, such as KEEP RIGHT (LEFT), may be placed along a temporary sidewalk to guide or direct pedestrians.
Figure 6H-28. Sidewalk Detour or Diversion (TA-28)

Typical Application 28

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

OMUTCD - English units are preferred.
OMUTCD - English units are preferred.

Notes for Figure 6H-29—Typical Application 29
Crosswalk Closures and Pedestrian Detours

Standard:

1. When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.

2. Curb parking shall be prohibited for at least 15 m (50 ft) in advance of the midblock crosswalk.

Guidance:

3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.

4. Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.

Option:

5. Street lighting may be considered.

6. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.

7. For nighttime closures, Type A Flashing warning lights may be used on barricades supporting signs and closing sidewalks.

8. Type C Steady-Burn warning lights may be used on channelizing devices separating the work space from vehicular traffic.

9. In order to maintain the systematic use of the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs in a jurisdiction, the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.
Figure 6H-29. Crosswalk Closures and Pedestrian Detours (TA-29)

Note: For long-term stationary work, the double yellow centerline and/or lane lines should be removed between the crosswalk lines.

See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-30—Typical Application 30
Interior Lane Closure on Multi-lane Street

Guidance:
1. This information applies to low-speed, low-volume urban streets. Where speed or volume is higher, additional signing such as LEFT LANE CLOSED AHEAD should be used between the signs shown.

Option:
2. The closure of the adjacent interior lane in the opposing direction may not be necessary, depending upon the activity being performed and the work space needed for the operation.
3. Shadow vehicles with a truck-mounted attenuator may be used.

Guidance:
4. When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the transition area precedes the highway-rail grade crossing.
5. Early coordination with the railroad company should occur before work starts.

Standard:
6. When an additional sign is used (see Note 1), the signs shown shall be relocated to accommodate standard sign spacing for the added sign.
Figure 6H-30. Interior Lane Closure on Multi-lane Street (TA-30)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 30

OMUTCD - English units are preferred.
Notes for Figure 6H-31—Typical Application 31
Lane Closure on Street with Uneven Directional Volumes

**Standard:**

1. The illustrated information shall be used only when the vehicular traffic volume indicates that two lanes of vehicular traffic shall be maintained in the direction of travel for which one lane is closed.

**Option:**

2. The procedure may be used during a peak period of vehicular traffic and then changed to provide two lanes in the other direction for the other peak.

**Guidance:**

3. For high speeds, a **RIGHT/LEFT LANE CLOSED XX FT** sign should be added for vehicular traffic approaching the lane closure, as shown in Figure 6H-32. Also, where speeds are 50 mile per hour or greater a shifting taper should be approximately L in length (see Table 6C-3).

4. Conflicting pavement markings should be removed for long-term projects. For short-term and intermediate-term projects where this is not practical, the channelizing devices in the area where the pavement markings conflict should be placed at a maximum spacing of 0.1 S m (0.5 S ft) where S is the speed in km/h (mph). Temporary markings should be installed where needed.

5. If the lane shift has curves with recommended speeds of 50 km/h (30 mph) or less, Reverse Turn signs should be used.

6. Where the shifted section is long, a Reverse Curve sign should be used to show the initial shift and a second sign should be used to show the return to the normal alignment.

7. If the tangent distance along the temporary diversion is less than 180 m (600 ft), the Double Reverse Curve sign should be used at the location of the first Two Lane Reverse Curve sign. The second Two Lane Reverse Curve sign should be omitted.

**Option:**

8. A longitudinal buffer space may be used in the activity area to separate opposing vehicular traffic.

9. An **ALL LANES THRU** supplemental plaque may be used to emphasize the point that all lanes shift and no lanes are closed.

10. A work vehicle or a shadow vehicle may be equipped with a truck-mounted attenuator.

11. The **Construction Arrow (W1-H11)** sign may be used to accent the lane shift condition.
Figure 6H-31. Lane Closures on Street with Uneven Directional Volumes (TA-31)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

OMUTCD - English units are preferred.
Notes for Figure 6H-32—Typical Application 32
Half Road Closure on Multi-lane, High-Speed Highway

Standard:

1. Pavement markings no longer applicable shall be removed or obliterated as soon as practical. Except for intermediate-term and short-term situations, temporary markings shall be provided to clearly delineate the temporary travel path. For short-term and intermediate-term situations where it is not feasible to remove and restore pavement markings, channelization shall be made dominant by using a very close device spacing.

Guidance:

2. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.

3. Where channelizing devices are used instead of pavement markings, the maximum spacing should be 0.1 S meters where S is the speed in km/h (0.5 S feet where S is the speed in mph).

4. If the tangent distance along the temporary diversion is more than 180 m (600 ft), a Reverse Curve sign, left first, should be used instead of the Double Reverse Curve sign, and a second Reverse Curve sign, right first, should be placed in advance of the second reverse curve back to the original alignment.

Option:

5. Warning lights may be used to supplement channelizing devices at night.

Guidance:

6. When a highway-rail grade crossing exists within or upstream of the merging taper and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the merging taper precedes the highway-rail grade crossing.

7. When a highway-rail grade crossing exists within the activity area, provisions should be made to provide road users operating on the left side of the normal centerline with comparable warning devices as supplied for road users operating on the right side of the normal centerline.

8. When a highway-rail grade crossing exists within the activity area, early coordination with the railroad company should occur before work starts.

Option:

9. When a highway-rail grade crossing exists within the activity area, a flagger may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.

10. A truck-mounted attenuator may be used on the work vehicle and/or the shadow vehicle.

11. The Construction Arrow (W1-H11) sign may be used to accent the lane shift condition.
Figure 6H-32. Half Road Closure on Multi-lane, High-Speed Highway (TA-32)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 32

OMUTCD - English units are preferred.
Notes for Figure 6H-33—Typical Application 33
Stationary Lane Closure on Divided Highway

Standard:

1. This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.

2. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed as needed.

Guidance:

3. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.

Option:

4. A truck-mounted attenuator may be used on the work vehicle and/or shadow vehicle.

Support:

5. Where conditions permit, restricting all vehicles, equipment, workers, and their activities to one side of the roadway might be advantageous.
Figure 6H-33. Stationary Lane Closure on Divided Highway (TA-33)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-34—Typical Application 34
Lane Closure with Temporary Traffic Barrier

Standard:

1. This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.

Guidance:

2. For long-term lane closures on facilities with permanent edge lines, a temporary edge line should be installed from the start of the merging taper to the far end of the downstream taper, and conflicting pavement markings should be removed.
3. The use of a barrier should be based on engineering judgment.

Standard:

4. Where temporary traffic barriers are installed, the ends of the barrier shall be treated in accordance with the provisions of Section 6F.81.
5. The barrier shall not be placed along the merging taper. The lane shall first be closed using channelizing devices and pavement markings.

Option:

6. The barrier shown in this typical application is an example of one method that may be used to close a lane for a long-term project. If the work activity permits, a movable barrier may be used and relocated to the shoulder during nonwork periods or peak-period vehicular traffic conditions, as appropriate.
7. Type C Steady-Burn warning lights may be placed on channelizing devices and the barrier parallel to the edge of pavement for nighttime lane closures.

Standard:

8. If a movable barrier is used, the temporary white edge line shown in the typical application shall not be used. During the period when the right lane is opened, the sign legends and the channelization shall be changed to indicate that only the shoulder is closed, as illustrated in Figure 6H-5. The arrow panel, if used, shall be placed at the end of the shoulder taper and shall display the caution mode.

Guidance:

9. If a movable barrier is used, the shift should be performed in the following manner. When closing the lane, the lane should be initially closed with channelizing devices placed along a merging taper using the same information employed for a stationary lane closure. The lane closure should then be extended with the movable-barrier transfer vehicle moving with vehicular traffic. When opening the lane, the movable-barrier transfer vehicle should travel against vehicular traffic from the termination area to the transition area. The merging taper should then be removed using the same information employed for a stationary lane closure.
Figure 6H-34. Lane Closure with Temporary Traffic Barrier (TA-34)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

OMUTCD - English units are preferred.
Notes for Figure 6H-35—Typical Application 35
Mobile Operation on Multi-lane Road

Standard:

1. Arrow panels shall, as a minimum, be Type B, with a size of 1500 x 750 mm (60 x 30 in).

Guidance:

2. Vehicles used for these operations should be made highly visible with appropriate equipment, such as: high-intensity rotating, flashing, oscillating, or strobe lights, flags, signs, or arrow panels.
3. Shadow Vehicle 1 should be equipped with an arrow panel and truck-mounted attenuator.
4. Shadow Vehicle 2 should be equipped with an arrow panel. An appropriate lane closure sign should be placed on Shadow Vehicle 2 so as not to obscure the arrow panel.
5. Shadow Vehicle 2 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.
6. The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.
7. Work should normally be accomplished during off-peak hours.
8. When the work vehicle occupies an interior lane (a lane other than the far right or far left) of a directional roadway having a right shoulder 3 m (10 ft) or more in width, Shadow Vehicle 2 should drive the right shoulder with a sign indicating that work is taking place in the interior lane.

Option:

9. A truck-mounted attenuator may be used on Shadow Vehicle 2.
10. On high-speed roadways, a third shadow vehicle (not shown) may be used with Shadow Vehicle 1 in the closed lane, Shadow Vehicle 2 straddling the edge line, and Shadow Vehicle 3 on the shoulder.
11. Where adequate shoulder width is not available, Shadow Vehicle 3 may drive partially in the lane.
Figure 6H-35. Mobile Operation on Multi-lane Road (TA-35)

Typical Application 35

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-36—Typical Application 36
Lane Shift on Freeway

Guidance:
1. The lane shift should be used when the work space extends into either the right or left lane of a divided highway and it is not practical, for capacity reasons, to reduce the number of available lanes.

2. When a lane shift is accomplished by using (1) geometry that meets the design speed at which the permanent highway was designed, (2) full normal cross-section (full lane width and full shoulders), and (3) complete pavement markings, then only the initial general work-zone warning sign is required.

3. When the conditions in Note 2 are not met, the information shown in the typical application should be employed and all the following notes apply.

Standard:
4. Where temporary traffic barriers are installed, the ends of the barrier shall be treated in accordance with the provisions of Section 6F.81.

5. A warning sign shall be used to show the changed alignment.

Guidance:
6. Where the shifted section is longer than 180 m (600 ft), one set of Reverse Curve signs should be used to show the initial shift and a second set should be used to show the return to the normal alignment. If the tangent distance along the temporary diversion is less than 180 m (600 ft), the Double Reverse Curve sign should be used instead of the first Reverse Curve sign. The second Reverse Curve sign should be omitted.

7. If a STAY IN LANE sign is used, then solid white lane lines should be used.

Standard:
8. The minimum width of the shoulder lane shall be 3 m (10 ft).

9. For long-term stationary work, existing conflicting pavement markings shall be removed and temporary markings shall be installed before traffic patterns are changed.

Option:
10. For short-term stationary work, lanes may be delineated by channelizing devices or removable pavement markings instead of temporary pavement markings.

11. Three Lane Reverse Curve signs may be used in place of the Reverse Curve signs. ALL LANES THRU supplemental plaques may be used to emphasize the point that all lanes shift and no lanes are closed.

12. If the shoulder cannot adequately accommodate trucks, trucks may be directed to use the travel lanes.

13. The barrier shown in this typical application is one method that may be used to close a lane for a long-term project.

14. The shifting taper may be approximately 0.5L where speeds are less than 50 miles per hour.

Guidance:
15. The use of a barrier should be based on engineering judgment.

Option:
16. Type C Steady-Burn warning lights may be placed on channelizing devices and the barrier parallel to the edge of pavement for nighttime lane closures.

17. The Construction Arrow (W1-H11) sign may be used to accent the lane shift condition.
Figure 6H-36. Lane Shift on Freeway (TA-36)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

OMUTCD - English units are preferred.
Notes for Figure 6H-37—Typical Application 37
Double Lane Closure on Freeway

Guidance:

1. Ordinarily, the preferred position for the second arrow panel is in the closed exterior lane at the beginning of the second merging taper. However, the second arrow panel should be placed in the closed interior lane at the end of the second merging taper in the following situations:
   a. When a shadow vehicle is used in the interior closed lane, and the second arrow panel is mounted on the shadow vehicle;
   b. If alignment or other conditions create any confusion as to which lane is closed by the second arrow panel; and
   c. When the first arrow panel is placed in the closed exterior lane at the end of the first merging taper (the alternative position when the shoulder is narrow).

Option:

2. Flashing warning lights and/or flags may be used to call attention to the initial warning signs.
3. A truck-mounted attenuator may be used on the shadow vehicle.
4. If a paved shoulder having a minimum width of 3 m (10 ft) and sufficient strength is available, the left and adjacent interior lanes may be closed and vehicular traffic carried around the work space on the right lane and a right shoulder.
5. When a shoulder lane is used that cannot adequately accommodate trucks, trucks may be directed to use the normal travel lanes.
Figure 6H-37. Double Lane Closure on Freeway (TA-37)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 37
Notes for Figure 6H-38—Typical Application 38
Interior Lane Closure on Freeway

Guidance:

1. For a long-term closure, a barrier should be used to provide additional safety to the operation in the closed interior lane. A buffer space should be used at the upstream end of the closed interior lane.

2. The first arrow panel displaying a right arrow should be on the left shoulder at the beginning of the taper. The arrow panel displaying a double arrow should be centered in the closed interior lane and placed at the downstream end of the shifting taper.

3. The placement of signs should not obstruct or obscure arrow panels.

4. For long-term use, the dashed lane lines should be made solid white in the two-lane section.

Option:

5. The arrow panel closing the exterior lane may be moved or omitted if the alignment is such that the two panels create confusion.

6. As an alternative to initially closing the left lane, as shown in the typical application, the right lane may be closed in advance of the interior lane closure with appropriate channelization and signs.

7. A short, single row of channelizing devices in advance of the vehicular traffic split to restrict vehicular traffic to their respective lanes may be added.

8. DO NOT PASS signs may be used.

9. If a paved shoulder having a minimum width of 3 m (10 ft) and sufficient strength is available, the left and center lanes may be closed and vehicular traffic carried around the work space on the right lane and a right shoulder.

10. When a shoulder lane is used that cannot adequately accommodate trucks, trucks may be directed to use the normal travel lanes.

11. The shifting taper may be approximately 0.5L where speeds are less than 50 miles per hour.
Figure 6H-38. Interior Lane Closure on Freeway (TA-38)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 38

OMUTCD - English units are preferred.
Notes for Figure 6H-39—Typical Application 39
Median Crossover on Freeway

Standard:

1. **Channelizing devices or temporary traffic barriers shall be used to separate opposing vehicular traffic.**

Guidance:

2. For long-term work on high-speed, high-volume highways, consideration should be given to using a temporary traffic barrier to separate opposing vehicular traffic.

Option:

3. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic, **DO NOT PASS, KEEP RIGHT, and DO NOT ENTER** signs may be eliminated.

4. The alignment of the crossover may be designed as a reverse curve.

Guidance:

5. When the crossover follows a curved alignment, the design criteria contained in the AASHTO “Policy on the Geometric Design of Highways and Streets” should be used (see Section 1A.11).

6. When channelizing devices have the potential of leading vehicular traffic out of the intended traffic space, the channelizing devices should be extended a distance in meters (feet) of 0.4 times the speed limit in km/h (2 times the speed limit in mph) beyond the end of the transition area as depicted.

7. Where channelizing devices are used, the Two-Way Traffic signs should be repeated every 1.6 km (1 mi).

Option:

8. **NEXT X MILES Supplemental Distance** plaques may be used with the Two-Way Traffic signs, where X is the distance to the end of the two-way section.

Support:

9. When the distance is sufficiently short that road users entering the section can see the far end of the section, they are less likely to forget that there is opposing vehicular traffic.

10. The sign legends for the four pairs of signs approaching the lane closure for the noncrossover direction of travel are not shown. They are similar to the series shown for the crossover direction, except that the left lane is closed.
Figure 6H-39. Median Crossover on Freeway (TA-39)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-40—Typical Application 40
Median Crossover for Entrance Ramp

Guidance:

1. The typical application illustrated should be used for carrying an entrance ramp across a closed directional roadway of a divided highway.

2. A temporary acceleration lane should be used to facilitate merging.

3. When used, the YIELD or STOP sign should be located far enough forward to provide adequate sight distance of oncoming mainline vehicular traffic to select a reasonably safe gap. If needed, yield or stop lines should be installed across the ramp to indicate the point at which road users should yield or stop. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed.

Option:

4. If vehicular traffic conditions allow, the ramp may be closed.

5. A broken edge line may be carried across the temporary entrance ramp to assist in defining the through vehicular traffic lane.

6. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs and the DO NOT ENTER signs may be eliminated.
Figure 6H-40. Median Crossover for Entrance Ramp (TA-40)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 40

OMUTCD - English units are preferred.
Notes for Figure 6H-41—Typical Application 41
Median Crossover for Exit Ramp

Guidance:

1. This typical application should be used for carrying an exit ramp across a closed directional roadway of a divided highway. The design criteria contained in the AASHTO “Policy on the Geometric Design of Highways and Streets” (see Section 1A.11) should be used for determining the curved alignment.

2. The guide signs should indicate that the ramp is open, and where the temporary ramp is located. Conversely, if the ramp is closed, guide signs should indicate that the ramp is closed.

3. When the exit is closed, a black on orange EXIT CLOSED panel should be placed diagonally across the interchange/intersection guide signs.

4. In the situation (not shown) where channelizing devices are placed along the mainline roadway, the devices’ spacing should be reduced in the vicinity of the off ramp to emphasize the opening at the ramp itself. Channelizing devices and/or temporary pavement markings should be placed on both sides of the temporary ramp where it crosses the median and the closed roadway.

5. Advance guide signs providing information related to the temporary exit should be relocated or duplicated adjacent to the temporary roadway.

Standard:

6. A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 2.1 m (7 ft) from the pavement surface to the bottom of the sign.

Option:

7. Guide signs referring to the exit may need to be relocated to the median.

8. The temporary EXIT sign placed in the temporary gore may be either black on orange or white on green.

9. In some instances, a temporary deceleration lane may be useful in facilitating the exiting maneuver.

10. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs may be omitted.
Figure 6H-41. Median Crossover for Exit Ramp (TA-41)

Typical Application 41

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-42—Typical Application 42

Work in Vicinity of Exit Ramp

Guidance:

1. The guide signs should indicate that the ramp is open, and where the temporary ramp is located. However, if the ramp is closed, guide signs should indicate that the ramp is closed.
2. When the exit ramp is closed, a black on orange EXIT CLOSED panel should be placed diagonally across the interchange/intersection guide signs.
3. The design criteria contained in the AASHTO “Policy on the Geometric Design of Highways and Streets” should be used for determining the alignment (see Section 1A.11).

Standard:

4. A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 2.1 m (7 ft) from the pavement surface to the bottom of the sign.

Option:

5. An alternative procedure that may be used is to channelize exiting vehicular traffic onto the right shoulder and close the lane as necessary.
**Figure 6H-42. Work in Vicinity of Exit Ramp (TA-42)**

Temporary yellow edge lines

Temporary white edge lines

30 m (100 ft)

300 m (1,000 ft)

Temporary yellow edge lines

Temporary white edge lines

Typical Application 42

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.
Notes for Figure 6H-43—Typical Application 43
Partial Exit Ramp Closure

Guidance:

1. Truck off-tracking should be considered when determining whether the minimum lane width of 3 m (10 ft) is adequate (see Section 6G.07).
Figure 6H-43. Partial Exit Ramp Closure (TA-43)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 43
Notes for Figure 6H-44—Typical Application 44
Work in Vicinity of Entrance Ramp

Guidance:

1. An acceleration lane of sufficient length should be provided whenever possible as shown on the left diagram.

Standard:

2. For the information shown on the diagram on the right side of the typical application, where inadequate acceleration distance exists for the temporary entrance, the YIELD sign shall be replaced with STOP signs (one on each side of the approach).

Guidance:

3. When used, the YIELD or STOP sign should be located so that ramp vehicular traffic has adequate sight distance of oncoming mainline vehicular traffic to select a reasonably safe gap in the mainline vehicular traffic flow. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed. If insufficient gaps are available, consideration should be given to closing the ramp.

4. Where STOP signs are used, a temporary stop line should be placed across the ramp at the desired stop location.

5. The mainline merging taper with the arrow panel at its starting point should be located sufficiently in advance so that the arrow panel is not confusing to drivers on the entrance ramp, and so that the mainline merging vehicular traffic from the lane closure has the opportunity to stabilize before encountering the vehicular traffic merging from the ramp.

6. If the ramp curves sharply to the right, warning signs with Advisory Speed Limits located in advance of the entrance terminal should be placed in pairs (one on each side of the ramp).

Option:

7. A Type B high-intensity warning flasher with a red lens may be placed above the STOP sign.

8. Where the acceleration distance is significantly reduced, a supplemental plaque may be placed below the YIELD AHEAD sign reading NO MERGE AREA.
Figure 6H-44. Work in Vicinity of Entrance Ramp (TA-44)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 44
Notes for Figure 6H-45—Typical Application 45
Temporary Reversible Lane Using Movable Barriers

Support:

1. This application addresses one of several uses for movable barriers in highway work zones. In this example, one side of a 6-lane divided highway is closed to perform the work operation, and vehicular traffic is carried in both directions on the remaining 3-lane roadway by means of a median crossover. To accommodate unbalanced peak-period vehicular traffic volumes, the direction of travel in the center lane is switched to the direction having the greater volume, with the transfer typically being made twice daily. Thus, there are four vehicular traffic phases described as follows:
   a. Phase A—two travel lanes northbound and one lane southbound;
   b. Transition A to B—one travel lane in each direction;
   c. Phase B—one travel lane northbound and two lanes southbound; and
   d. Transition B to A—one travel lane in each direction.

The typical application on the left illustrates the placement of devices during Phase A. The typical application on the right shows conditions during the transition (Transition A to B) from Phase A to Phase B.

Guidance:

2. For the reversible-lane situation depicted, the ends of the movable barrier should terminate in a protected area or a crash cushion should be provided. During Phase A, the transfer vehicle should be parked behind the end of the movable barrier. During Phase B, the transfer vehicle should be parked behind the end of the movable barrier.

The transition shift from Phase A to B should be as follows:
   a. Change the signs in the northbound advance warning area and transition area from a LEFT LANE CLOSED AHEAD to a LEFT TWO LANES CLOSED AHEAD. Change the mode of the second northbound arrow panel from Caution to Right Arrow.
   b. Place channelizing devices to close the northbound center lane.
   c. Move the transfer vehicle from south to north to shift the movable barrier from the west side to the east side of the reversible lane.
   d. Remove the channelizing devices closing the southbound center lane.
   e. Change the signs in the southbound transition area and advance warning area from a LEFT TWO LANES CLOSED AHEAD to LEFT LANE CLOSED AHEAD. Change the mode of the second southbound arrow panel from Right Arrow to Caution.

3. Where the lane to be opened and closed is an exterior lane (adjacent to the edge of the traveled way or the work space), the lane closure should begin by closing the lane with channelizing devices placed along a merging taper using the same information employed for a stationary lane closure. The lane closure should then be extended with the movable-barrier transfer vehicle moving with vehicular traffic. When opening the lane, the transfer vehicle should travel against vehicular traffic. The merging taper should be removed in a method similar to a stationary lane closure.
Figure 6H-45. Movable Barriers (TA-45)

Typical Application 45

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure. Although leader lines point to signs on the right side of the roadway, most signs should be installed on both sides of the roadway.
Notes for Figure 6H-46—Typical Application 46
Work in Vicinity of Highway-Rail Grade Crossing

Guidance:
1. When highway-rail grade crossings exist either within or in the vicinity of roadway work activities, extra care should be taken to minimize the probability of conditions being created, either by lane restrictions, flagging, or other operations, where vehicles might be stopped within the highway-rail grade crossing, considered as being 4.6 m (15 ft) on either side of the closest and farthest rail.

Standard:
2. If the queuing of vehicles across active rail tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the highway-rail grade crossing to prevent vehicles from stopping within the highway-rail grade crossing (as described in Note 1), even if automatic warning devices are in place.

Guidance:
3. Early coordination with the railroad company should occur before work starts.
4. In the example depicted, the buffer space of the activity area should be extended upstream of the highway-rail grade crossing (as shown) so that a queue created by the flagging operation will not extend across the highway-rail grade crossing.
5. The DO NOT STOP ON TRACKS sign should be used on all approaches to a highway-rail grade crossing within the limits of a TTC zone.

Option:
6. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
7. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:
8. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

Standard:
9. At night, flagger stations shall be illuminated, except in emergencies.
Figure 6H-46. Work in Vicinity of Highway-Rail Grade-Crossing (TA-46)

Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 46

OMUTCD - English units are preferred.
Intentionally blank.
CHAPTER 6I. CONTROL OF TRAFFIC THROUGH TRAFFIC INCIDENT MANAGEMENT AREAS

Section 6I.01 General

Support:
Whenever the acronym “TTC” is used in this Chapter, it refers to “temporary traffic control”.

Standard:
The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), Title II, Paragraph 35.130) through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.

Support:
A traffic incident is an emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic.

A traffic incident management area is an area of a highway where temporary traffic controls are imposed by authorized officials in response to a road user incident, natural disaster, hazardous material spill, or other unplanned incident. It is a type of TTC zone and extends from the first warning device (such as a sign, light, or cone) to the last TTC device or to a point where vehicles return to the original lane alignment and are clear of the incident.

Traffic incidents can be divided into three general classes of duration, each of which has unique traffic control characteristics and needs. These classes are:

A. Major—expected duration of more than 2 hours;
B. Intermediate—expected duration of 30 minutes to 2 hours; and
C. Minor—expected duration under 30 minutes.

The primary functions of TTC at a traffic incident management area are to move road users reasonably safely and expeditiously past or around the traffic incident, to reduce the likelihood of secondary traffic crashes, and to preclude unnecessary use of the surrounding local road system. Examples include a stalled vehicle blocking a lane, a traffic crash blocking the traveled way, a hazardous material spill along a highway, and natural disasters such as floods and severe storm damage.

Guidance:
In order to reduce response time for traffic incidents, highway agencies, appropriate public safety agencies (law enforcement, fire and rescue, emergency communications, emergency medical, and other emergency management), and private sector responders (towing and recovery and hazardous materials contractors) should mutually plan for occurrences of traffic incidents along the major and heavily traveled highway and street system.

On-scene responders should be trained in safe practices for accomplishing their tasks in and near traffic. Responders should always be aware of their visibility to oncoming traffic and take measures to move the traffic incident as far off the traveled roadway as possible or to provide for appropriate warning.

Responders arriving at a traffic incident should, within 15 minutes of arrival on-scene, estimate the magnitude of the traffic incident, the expected time duration of the traffic incident, and the expected vehicle queue length, and then should set up the appropriate temporary traffic controls for these estimates.

Option:
Warning and guide signs used for TTC traffic incident management situations may have a black legend and border on a fluorescent pink background (see Figure 6I-1).
Support:

While some traffic incidents might be anticipated and planned for, emergencies and disasters might pose more severe and unpredictable problems. The ability to quickly install proper temporary traffic controls might greatly reduce the effects of an incident, such as secondary crashes or excessive traffic delays. An essential part of fire, rescue, spill clean-up, highway agency, and enforcement activities is the proper control of road users through the traffic incident management area in order to protect responders, victims, and other personnel at the site while providing reasonably safe traffic flow. These operations might need corroborating legislative authority for the implementation and enforcement of appropriate road user regulations, parking controls, and speed zoning. It is desirable for these statutes to provide sufficient flexibility in the authority for, and implementation of, TTC to respond to the needs of changing conditions found in traffic incident management areas.

Option:

For traffic incidents, particularly those of an emergency nature, TTC devices on hand may be used for the initial response as long as they do not themselves create unnecessary additional hazards.

Section 6l.02  Major Traffic Incidents

Support:

Major traffic incidents are typically traffic incidents involving hazardous materials, fatal traffic crashes involving numerous vehicles, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility for a period exceeding 2 hours.

Guidance:

If the traffic incident is anticipated to last more than 24 hours, applicable procedures and devices set forth in other Chapters of Part 6 should be used.

Support:

A road closure can be caused by a traffic incident such as a road user crash that blocks the traveled way. Road users are usually diverted through lane shifts or detoured around the traffic incident and back to the original roadway. A combination of traffic engineering and enforcement preparations is needed to determine...
the detour route and to install, maintain or operate, and then to remove the necessary traffic control devices when the detour is terminated. Large trucks are a significant concern in such a detour, especially when detouring them from a controlled-access roadway onto local or arterial streets.

During traffic incidents, large trucks might need to follow a route separate from that of automobiles because of bridge, weight, clearance, or geometric restrictions. Also, vehicles carrying hazardous material might need to follow a different route from other vehicles.

Some traffic incidents such as hazardous material spills might require closure of an entire highway. Through road users must have adequate guidance around the traffic incident. Maintaining good public relations is desirable. The cooperation of the news media in publicizing the existence of, and reasons for, traffic incident management areas and their TTC can be of great assistance in keeping road users and the general public well informed.

The establishment, maintenance, and prompt removal of lane diversions can be effectively managed by inter-agency planning that includes representatives of highway and public safety agencies.

Guidance:

All traffic control devices needed to set up the TTC at a traffic incident should be available so that they can be readily deployed for all major traffic incidents. The TTC should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert approaching traffic of the end of a queue.

Attention should be paid to the end of the traffic queue such that warning is given to road users approaching the end of the queue.

If manual traffic control is needed, it should be provided by qualified flaggers or uniformed law enforcement officers.

Option:

If flaggers are used to provide traffic control for an incident management situation, the flaggers may use appropriate traffic control devices that are readily available or that can be brought to the traffic incident scene on short notice.

Guidance:

When flares are used to initiate TTC at traffic incidents, more permanent traffic control devices should replace them as soon as practical. Both the flare and its supporting device should then be removed from the roadway.

On-scene responders should be trained in safe practices for accomplishing their tasks in and near traffic. Responders should always be aware of their visibility to oncoming traffic and take measures to move the traffic incident as far off the traveled roadway as possible or to provide for appropriate warning.

Section 6I.03 Intermediate Traffic Incidents

Support:

Intermediate traffic incidents typically affect travel lanes for a time period of 30 minutes to 2 hours, and usually require traffic control on the scene to divert road users past the blockage. Full roadway closures might be needed for short periods during traffic incident clearance to allow traffic incident responders to accomplish their tasks.

The establishment, maintenance, and prompt removal of lane diversions can be effectively managed by inter-agency planning that includes representatives of highway and public safety agencies.

Guidance:

All traffic control devices needed to set up the TTC at a traffic incident should be available so that they can be readily deployed for intermediate traffic incidents. The TTC should include the proper traffic diversions, tapered lane closures, and upstream warning devices to alert approaching traffic of the end of a queue.
Attention should be paid to the end of the traffic queue such that warning is given to road users approaching the end of the queue.

If manual traffic control is needed, it should be provided by qualified flaggers or uniformed law enforcement officers.

Option:

If flaggers are used to provide traffic control for an incident management situation, the flaggers may use appropriate traffic control devices that are readily available or that can be brought to the traffic incident scene on short notice.

Guidance:

When flares are used to initiate TTC at traffic incidents, more permanent traffic devices should replace them as soon as practical. Both the flare and its supporting device should then be removed from the roadway.

On-scene responders should be trained in safe practices for accomplishing their tasks in and near traffic. Responders should always be aware of their visibility to oncoming traffic and take measures to move the traffic incident as far off the traveled roadway as possible or to provide for appropriate warning.

Section 6I.04 Minor Traffic Incidents

Support:

Minor traffic incidents are typically disabled vehicles and minor crashes that result in lane closures of less than 30 minutes. On-scene responders are typically law enforcement and towing companies, and occasionally highway agency service patrol vehicles.

Diversion of traffic into other lanes is often not needed or is needed only briefly. It is not generally possible or practical to set up a lane closure with traffic control devices for a minor traffic incident. Traffic control is the responsibility of on-scene responders.

Guidance:

When a minor traffic incident blocks a travel lane, it should be removed from that lane to the shoulder as quickly as possible.

Section 6I.05 Use of Emergency-Vehicle Lighting

Support:

The use of emergency-vehicle lighting (such as high-intensity rotating, flashing, oscillating, or strobe lights) is essential, especially in the initial stages of a traffic incident, for the safety of emergency responders and persons involved in the traffic incident, as well as road users approaching the traffic incident. Emergency-vehicle lighting, however, provides warning only and provides no effective traffic control. It is often confusing to road users, especially at night. Road users approaching the traffic incident from the opposite direction on a divided facility are often distracted by emergency-vehicle lighting and slow their vehicles to look at the traffic incident posing a hazard to themselves and others traveling in their direction.

The use of emergency-vehicle lighting can be reduced if good traffic control has been established at a traffic incident scene. This is especially true for major traffic incidents that might involve a number of emergency vehicles. If good traffic control is established through placement of advanced warning signs and traffic control devices to divert or detour traffic, then public safety agencies can perform their tasks on scene with minimal emergency-vehicle lighting.

Guidance:

Public safety agencies should examine their policies on the use of emergency-vehicle lighting, especially after a traffic incident scene is secured, with the intent of reducing the use of this lighting as much as possible while not endangering those at the scene. Special consideration should be given to reducing or extinguishing
forward facing emergency-vehicle lighting, especially on divided roadways, to reduce distractions to on-
coming road users.

Vehicle headlights not needed for illumination, or to provide notice to other road users of the incident
response vehicle being in an unexpected location, should be turned off at night.