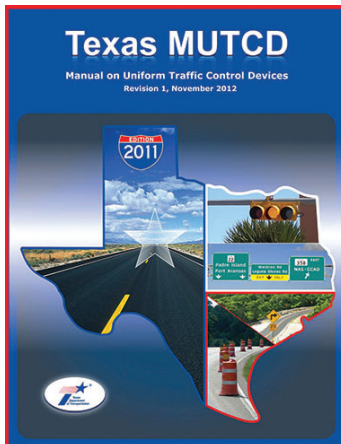


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# REFERENCE GUIDE TO THE 2011 TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

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Introduction, Part 1, Part 5, Part 6



**Texas Department of Transportation**

*Printed May 2014*

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*The material in this guide is extracted from the 2011 Texas Manual on Uniform Traffic Control Devices (TMUTCD), adopted by the Texas Transportation Commission on November 17, 2011, and includes Revision 1, November 2012.*

*The TMUTCD should be considered the source document for all items discussed within this guide. The intent of this document is to serve as a “quick reference” to the temporary traffic control-related standards, guidance and options and support statements contained within the TMUTCD, and for use as a “field guide” for personnel involved in work zone traffic control on public roadways within Texas.*

*When referencing the source 2011 TMUTCD, this guide will show, above the referenced text, the Page Number from the source document.*

*The 2011 TMUTCD, and previous editions, are maintained by the Texas Department of Transportation (TxDOT), and are available for download through the TxDOT website at [www.txdot.gov](http://www.txdot.gov).*

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2011 TMUTCD ORGANIZATION

Introduction

Part 1: General

Part 2: Signs

Part 3: Markings

Part 4: Highway Traffic Signals

Part 5: Traffic Control Devices for Low Volume Roads

Part 6: Temporary Traffic Control

Part 7: Traffic Control for School Areas

Part 8: Traffic Control for Railroad and Light Rail Transit Grade  
Crossings

Part 9: Traffic Control for Bicycle Facilities

*This guide summarizes standards, guidance, options and support statements from the Introduction, Part 1, Part 5 and Part 6 only.*

LEGAL AUTHORITY

*The Texas Transportation Code, Title 7, Vehicles and Traffic, Subtitle C, Rules of the Road, Chapter 544, Traffic Signs, Signals and Markings, Section 544.001 contains the following language:*

Sec. 544.001. ADOPTION OF SIGN MANUAL FOR STATE HIGHWAYS. The Texas Transportation Commission shall adopt a manual and specifications for a uniform system of traffic-control devices consistent with this chapter that correlates with and to the extent possible conforms to the system approved by the American Association of State Highway and Transportation Officials.

*Texas Transportation Commission Minute Order 112903 passed on November 17, 2011 states:*

“This manual, with subsequent revisions, shall apply to all traffic control devices installed on or after adoption of this manual upon the highways, roads and streets of this State...”

# Texas MUTCD

Manual on Uniform Traffic Control Devices

## Introduction



**Standard:** Traffic control devices shall be defined as all signs, signals, markings, and other devices used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, pedestrian facility, bikeway, or private road open to public travel (see definition in Section 1A.13) by authority of a public agency or official having jurisdiction, or, in the case of a private road, by authority of the private owner or private official having jurisdiction.

**Standard:** After the effective date of a new edition of the TMUTCD or a revision thereto new or reconstructed devices shall be in compliance with the new edition or revision unless a particular device is no longer serviceable, non-compliant devices on existing highways and bikeways shall be brought into compliance with the current edition of the TMUTCD as part of the systematic upgrading of substandard traffic control devices. The FHWA has the authority to establish other target compliance dates for implementation of particular changes. The TMUTCD will adhere to these dates and these target compliance dates are shown in Table I-1.



# Texas MUTCD

Manual on Uniform Traffic Control Devices

# Part 1

**General**



Support: The purpose of traffic control devices, as well as the principles for their use, is to promote highway efficiency by providing for the orderly movement of all road users on streets, highways, bikeways, and private roads open to public travel throughout Texas and the Nation.

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.

TMUTCD Page 2

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.

Guidance (continued): 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.

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.

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

Black – regulation

Blue – Road service, guidance, tourist information & evacuation route.

Brown – recreation, cultural interest

Fluorescent Pink – incident management

Fluorescent Yellow Green – Pedestrian warning, bicycle warning, school bus & playground warning

Coral – unassigned

Green – indicated movements permitted, direction guidance

Light Blue – unassigned

Orange – temporary traffic control

Purple – lanes restricted to use only by vehicles with registered electronic toll collection accounts

Red – stop or prohibition

White – regulation

Yellow - warning

**Standard: When used in this Manual, the text headings of Standards, Guidance, Options and Support shall be defined as follows:**

A. Standard—a statement of required, mandatory, or specifically prohibitive practice regarding a traffic control device. All Standard statements are labeled, and the text appears in bold type. The verb “shall” is typically used. The verbs “should” and “may” are not used in Standard statements. Standard statements are sometimes modified by Options.

B. Guidance—a statement of recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. All Guidance statements are labeled, and the text appears in unbold type. The verb “should” is typically used. The verbs “shall” and “may” are not used in Guidance statements. Guidance statements are sometimes modified by Options.

C. Option—a statement of practice that is a permissive condition and carries no requirement or recommendation. Option statements sometime contain allowable modifications to a Standard or Guidance statement. All Option statements are labeled, and the text appears in unbold type. The verb “may” is typically used. The verbs “shall” and “should” are not used in Option statements.

D. Support—an informational statement that does not convey any degree of mandate, recommendation, authorization, prohibition, or enforceable condition. Support statements are labeled, and the text appears in unbold type. The verbs “shall,” “should,” and “may” are not used in Support statements.

TMUTCD Pages 10 through 23

*The TMUTCD provides the definition of words and phrases used in the Manual.*

TMUTCD Page 23

*Meanings of acronyms and abbreviations used in the Manual are shown.*

TMUTCD Page 24 through 26

*Acceptable abbreviations are shown on Page 24.*

*Abbreviations to be used only on Portable Changeable Message Signs are shown on Page 25.*

*Unacceptable abbreviations are shown on Page 26.*

# Texas MUTCD

Manual on Uniform Traffic Control Devices

## Part 5

Traffic Control Devices for  
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, an expressway, an interchange ramp, a freeway service road, a road on a designated State highway system, or a residential street in a neighborhood. In terms of highway classification, it shall be a variation of a conventional road or a special purpose road as defined in Section 1A.13.

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

**Standard: The provisions contained in Part 5 shall not prohibit the installation or the full application of traffic control devices on a low-volume road where conditions justify their use.**

# Texas MUTCD

Manual on Uniform Traffic Control Devices

# Part 6

## Temporary Traffic Control





**Standard: The needs and control of all road users (motorists, bicyclists, and pedestrians within the highway, or on private roads open to public travel, including persons with disabilities...through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.**

Support: Of equal importance to the public traveling through the TTC zone is the safety of the workers performing the many varied tasks within the work space. 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.

Guidance: Seven fundamental principles of TTC:

1. Plans and guidelines should be developed to provide safety for motorists, bicyclists, pedestrians, workers, enforcement/emergency officials, and equipment.
2. Road user movement should be inhibited as little as practical.

Guidance: Seven fundamental principles (continued)

3. Motorists, bicyclists, and pedestrians should be guided in a clear and positive manner.
4. Routine day and night inspection of TTC elements should be performed.
5. Attention should be given to roadside safety.
6. Each person should receive training appropriate to the job decisions each individual is required to make.
7. Good public relations should be maintained.

**Standard: 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.**

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

Option: Modifications of TTC plans may be necessary because of changed conditions or a determination of better methods of safety and efficiently handling them.

Guidance: Reduced speed limits should be used only in the specific portion of the TTC zone where conditions or restrictive features are present. Frequent changes in the speed limit should be avoided. A TTC plan should be designed so that vehicles can travel through the TTC zone with a speed limit reduction of no more than 10 mph.

Reduced speed zoning should be avoided as much as practical.

Support: a TTC zone is an area of a highway where road user conditions are changed.

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 and/or work vehicles. It extends from the first sign or light on a vehicle to the END ROAD WORK sign or the last TTC device.

Support: Most TTC zones are divided into four areas: the advance warning area, the transition area, the activity area, and the termination area.

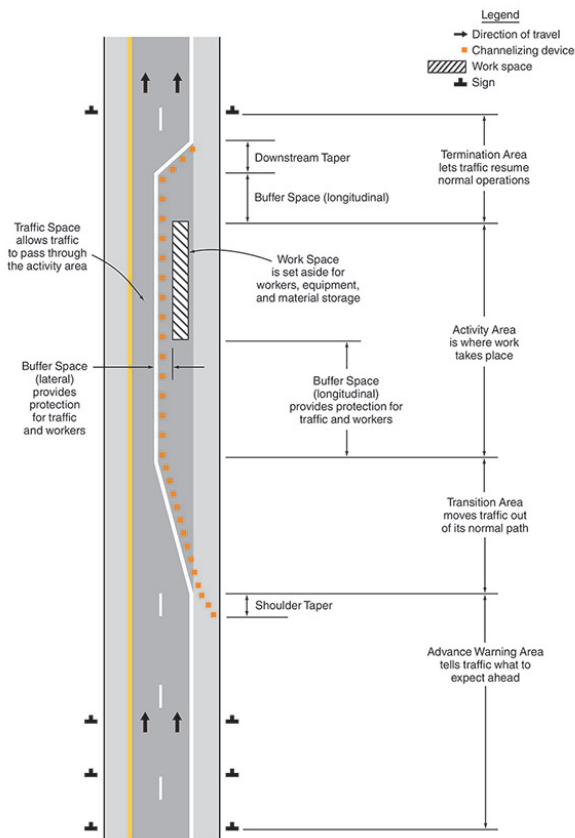
Standard: When the work space is within the traveled way, except for short-duration and mobile operations, advance warning shall provide a general message that work is taking place.

Guidance: When the work space is within the traveled way... advance warning should supply information about prevailing highway conditions if possible and should indicate how motor vehicles can move through the TTC zone.

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 ...light on a vehicle, to a series of signs...

Figure 6C-1. Component Parts of a Temporary Traffic Control Zone



## **Notes for Table 6C-1 – Suggested Advance Warning Sign Spacing**

Guidance: The distances contained in Table 6C-1 are approximate, are intended for guidance purposes only, and should be applied with engineering judgment. These distances should be adjusted for field conditions, if necessary, by increasing or decreasing the recommended distances.

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.

Support: The transition area is that section of highway where road users are redirected out of their normal path.

Option: Because it is impractical in mobile operations to redirect the road user's normal path with stationary channelization, more dominant vehicle-mounted devices...may be used instead of channelizing devices to establish a transition area.

Table 6C-1. **Suggested Advance Warning Sign Spacing**

Road Classification	Posted Speed (MPH)	Sign Spacing "X" (Feet)	
Conventional Highway	25	100	
	30	120	
	35	160	
	40	240	
	45	320	
	50	400	
	55*	500	
	60*	600	
	65*	700	
	70*	800	
Expressway or Freeway	All Speeds	75*	900
		80*	1000
		See Typical Applications (Chapter 6H) **	

\* Distance between signs should be increased to have 1500 feet advance warning (See Section 6C.04.07)

\*\* Distance between signs should be increased to have 1/2 mile or more advance warning.

(See Section 6C.04.05)

### **Notes for Table 6C-3 – Longitudinal Buffer Space**

**Support:** The Activity area is the section...where the work activity takes place. It is comprised of the work space, the traffic space, and the buffer space.

**Guidance:** Since there might be several work spaces (some even separated by several miles) within the project limits, each work space should be adequately signed...

**Support:** The buffer space is a lateral and/or longitudinal area that separates road user flow from the work space...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:** 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:** when a shadow vehicle, arrow board, or changeable message sign is placed in a closed lane in advance of a work space, only the area upstream of the vehicle, arrow board, or changeable message sign constitutes the buffer space.

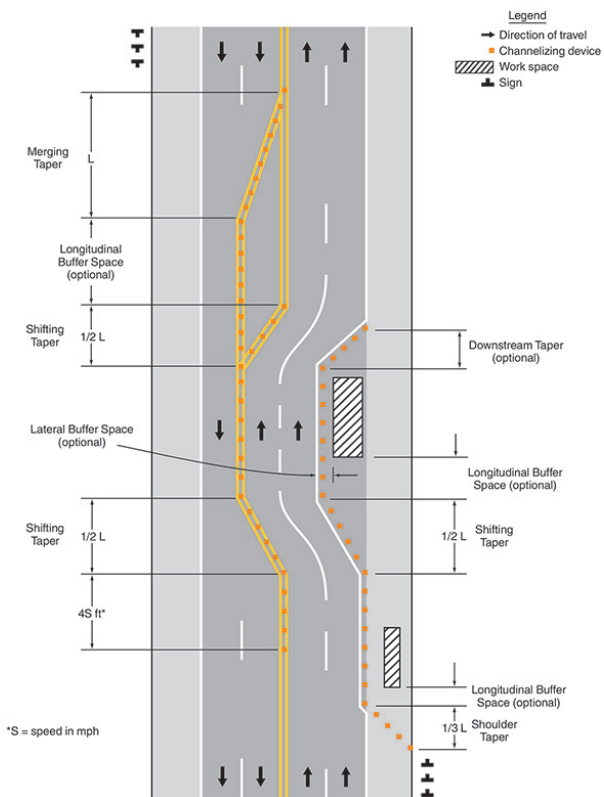
**Guidance:** the width of a lateral buffer space should be determined by engineering judgment.



**Table 6C-3. Longitudinal Buffer Space**

<b>Speed (mph)</b>	<b>Length (Feet)</b>
20	40
25	60
30	90
35	120
40	155
45	195
50	240
55	295
60	350
65	410
70	475
75	540
80	615

Figure 6C-2. Types of Tapers and Buffer Spaces



\*S = speed in mph

Note: See Figure 6C-3 for an example of a one-lane, two way traffic taper not shown here.

### **Notes for Tables 6C-3 and 6C-4 – Taper Lengths**

**Support:** The termination area is the section of the highway where road users are returned to their normal driving path.

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

**Option:** ...whenever tapers are to be used in close proximity to an interchange ramp, crossroad, curve...the length of tapers may be adjusted.

**Support:** Longer tapers are not necessarily better than shorter tapers (particularly in urban areas...). The test concerning adequate lengths of tapers involves observation of driver performance...

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

The maximum distance in feet between devices in a merging, shoulder or shifting taper should not exceed 1.0 times the speed limit in mph.

**Table 6C-4. Merging Taper Lengths and Spacing of Channelizing Devices**

Posted Speed	*Minimum Taper Length			Maximum Spacing		Minimum Buffer
	10 Ft	11 Ft	12 Ft	Taper	Tangent	
30	150'	165'	180'	30'	60'	90'
35	205'	225'	245'	35'	70'	120'
40	265'	295'	320'	40'	80'	155'
45	450'	495'	540'	45'	90'	195'
50	500'	550'	600'	50'	100'	240'
55	550'	605'	660'	55'	110'	295'
60	600'	660'	720'	60'	120'	350'
65	650'	715'	780'	65'	130'	410'
70	700'	770'	840'	70'	140'	475'
75	750'	825'	900'	75'	150'	540'
80	800'	880'	960'	80'	160'	615'

\*Minimum Buffer table is shown in MUTCD on page 577

**Table 6C-3: Taper Length Criteria for Temporary Traffic Control Zones**

Type of Taper	Taper Length
Merging	At Least "L"
Shifting	At Least 1/2 "L"
Shoulder	At Least 1/3 "L"
One-Lane, Two-Way Traffic (Flagger)	50 feet minimum
	100 feet maximum
Downstream	50 feet minimum
	100 feet maximum

Guidance: *A merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds into an adjacent lane before the downstream end of the transition.* Multiple merging tapers should have a tangent length of at least  $2L$  between them. Adjoining merging and shifting tapers should have a tangent length of at least  $1/2 L$  between them.

A shifting taper should have a length of at least  $1/2 L$ .

If used, shoulder tapers should have a length of at least  $1/3 L$ . 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.

If used, a downstream taper should have a minimum length of 50 feet and a maximum length of 100 feet with devices placed at a spacing of approximately 20 feet.

Guidance: Traffic should be controlled by a flagger or temporary traffic control signal, or a STOP or YIELD sign. A short taper having a minimum length of 50 feet and a maximum length of 100 feet with channelizing devices at approximately 20-foot spacing should be used...and a downstream taper should be used...

Support: A wide range of pedestrians might be affected by TTC zones... These pedestrians need a clearly delineated and usable travel path.

**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...**

Guidance: To accommodate the needs of pedestrians... the following considerations should be addressed...

- A. ...continuity of accessible paths...
- B. Access to transit stops...
- C. Smooth, continuous hard surface... (ADAAG)
- D. ...60 inch width or 60 inch passing space every 200 feet...

- E. Blocked routes...should be communicated...
- F. ...continuous detectable edging...
- G. Signs lower than 7 feet should not project more than 4 inches...

Support: Equally as important as the safety of road users is the safety of workers.

Guidance: The following are the key elements of worker safety...

- A. Training-
- B. Temporary Traffic Barriers-
- C. Speed Reduction-
- D. Activity Area-
- E. Worker Safety Planning-

Standard: All workers...within the right-of-way... shall wear high-visibility safety apparel that meets the Performance Class 2 or 3 requirements of the ANSI/ISEA 107-2004...and labeled as meeting... standard performance for Class 2 or 3 risk exposure.

Option: The following are additional elements ... considered to improve worker safety:

- A. Shadow vehicle-
- B. Road closure-
- C. Law enforcement use-
- D. Lighting-
- E. Special Devices-

Guidance: Flaggers should be able to:

Ability to:

- A. Receive and communicate specific instructions
- B. Move and maneuver quickly
- C. Control signaling devices
- D. Understand and apply safe traffic control practices
- E. Recognize danger and warn workers

Standard: For day and night activity, flaggers shall wear... Class 2 or 3 high visibility apparel.

Guidance: For nighttime activity, high-visibility safety apparel that meets...Performance Class 3...should be considered for flagger wear.



Guidance: The STOP/SLOW paddle should be the primary and preferred hand-signaling device...Use of flags should be limited to emergency situations.

**Standard: The STOP/SLOW paddle shall have an octagonal shape on a rigid handle. ...Paddles shall be at least 18 inches wide with letters at least 6 inches high... When used at night, STOP/SLOW paddles shall be retroreflectorized.**

Guidance: STOP/SLOW paddles should be 24" wide with letters 8" high when used on roadways with higher speeds or traffic volumes.

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

Option: The STOP/SLOW paddle may be modified to improve conspicuity by incorporating either white or red flashing lights on the STOP face, and either white or yellow flashing lights on the SLOW face.

**Standard: When used at nighttime, flags of either color shall be retroreflective.**

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

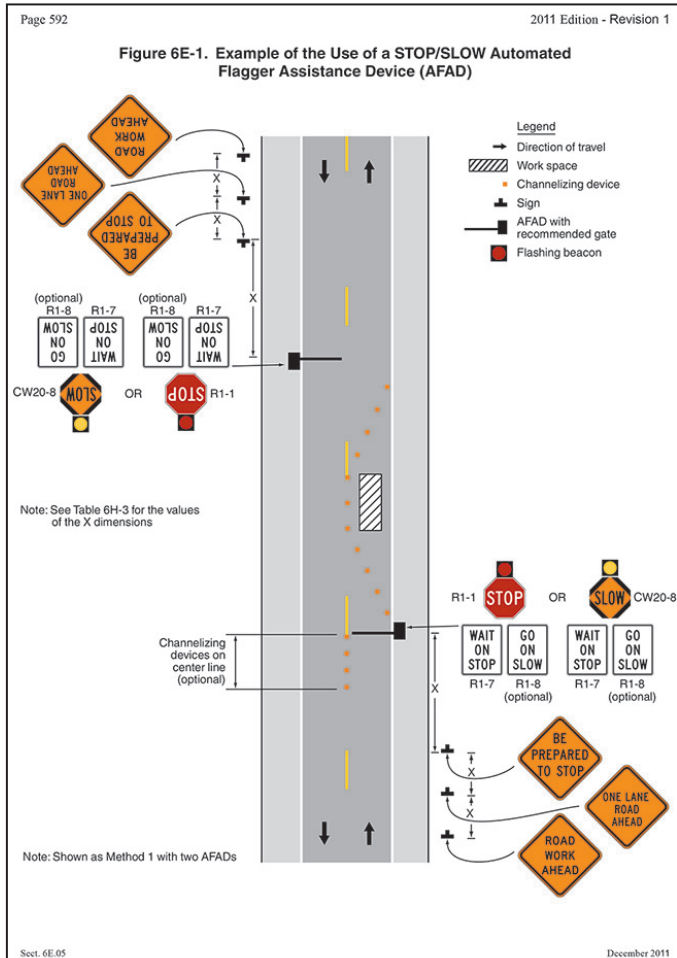
- A. To inform road users to stop, the flagger shall hold the flashlight with the left arm extended and pointed down toward the ground, and then shall slowly wave the flashlight in front of the body in a slow arc from left to right such that the arc reaches no farther than 45 degrees from vertical.
- B. To inform road users to proceed, the flagger shall point the flashlight at the vehicle's bumper, slowly aim the flashlight toward the open lane, then hold the flashlight in that position. The flagger shall now wave the flashlight.
- C. To alert or slow traffic, the flagger shall point the flashlight toward oncoming traffic and quickly wave the flashlight in a figure eight motion.

Support: Automated Flagger Assistance Devices (AFADs)  
enable a flagger to be positioned out of the lane of traffic...

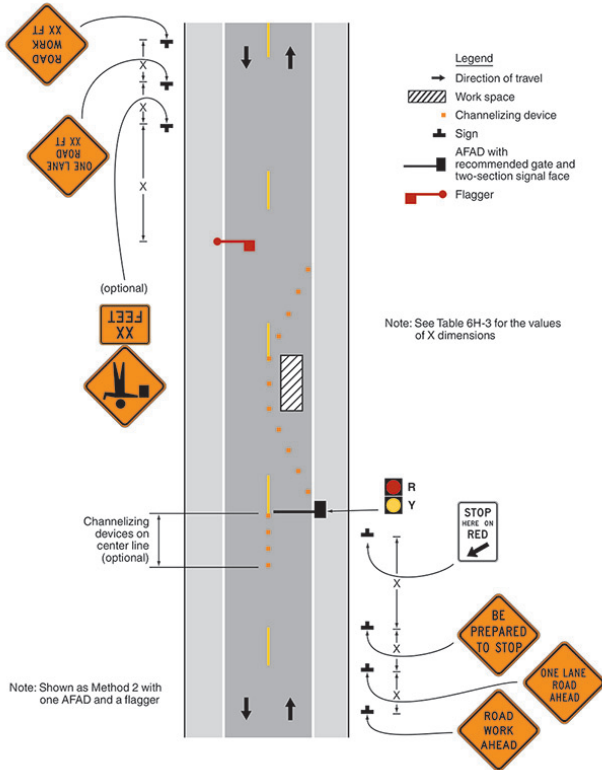
Support: There are two types of AFADs:

- A. STOP/SLOW sign on trailer or a moveable cart
- B. Red / yellow lenses and gate arm

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



**Figure 6E-2. Example of the Use of a Red/Yellow Lens Automated Flagger Assistance Device (AFAD)**



## **Notes for Figure 6E-3 – Use of Hand-Signaling Devices by Flaggers**

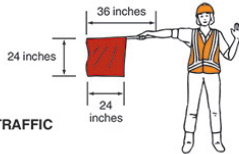
**Standard: Flaggers shall use a STOP/SLOW paddle, a flag, or an AFAD to control road users... The use of hand movements alone without a paddle, flag or AFAD...shall be prohibited except for law enforcement personnel or emergency responders.**

Guidance: The flagger should stand either on the shoulder adjacent to the road 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...The flagger should be stationed sufficiently in advance of the workers to warn them... The flagger should stand alone, away from other workers, work vehicles or equipment.

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

**PREFERRED METHOD  
STOP/SLOW Paddle**

**EMERGENCY SITUATIONS ONLY  
Red Flag**



**TO STOP TRAFFIC**



**TO LET  
TRAFFIC PROCEED**



**TO ALERT AND  
SLOW TRAFFIC**

**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...may be used for the location of a flagger station...

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

**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.**

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

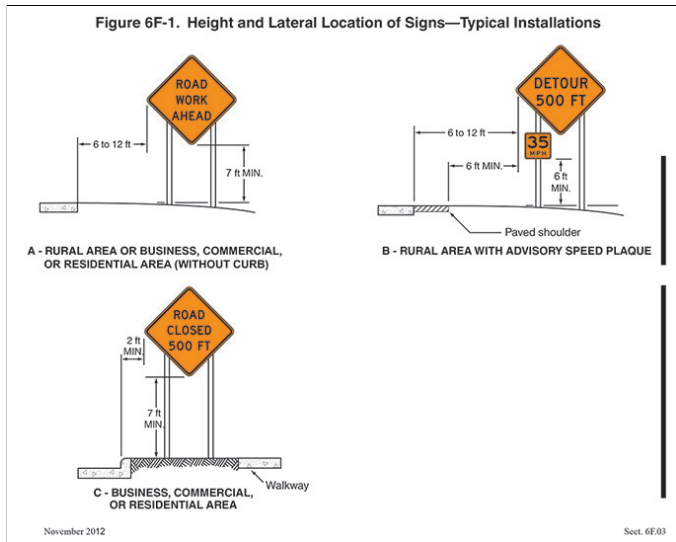
Speed	Distance	Speed	Distance	Speed	Distance
20 mph	115 ft.	40 mph	305 ft.	60 mph	570 ft.
25 mph	155 ft.	45 mph	360 ft.	65 mph	645 ft.
30 mph	200 ft.	50 mph	425 ft.	70 mph	730 ft.
35 mph	250 ft.	55 mph	495 ft.	75 mph	820 ft.
				80 mph	910 ft.



Standard: The minimum height...of signs installed at the side of the road in rural areas shall be 7 feet, or 6 feet to the bottom of a supplemental plaque...

The minimum height...of the sign installed in business, commercial or residential areas...shall be 7 feet (**see Figure 6F-1**)

The minimum height...of signs installed above sidewalks shall be 7 feet.



Support: Portable changeable message Signs (PCMS) are used most frequently on high-density urban freeways, but have applications on all types of highways...

Guidance: A PCMS should be limited to three lines of eight characters per line, or should consist of a full matrix display.

Messages... should consist of no more than two phases, and a phase should consist of no more than three lines of text. Messages should be centered within each line of legend...

**Standard: Animation, rapid flashing, dissolving, exploding, scrolling, traveling horizontally or vertically...or other dynamic elements shall not be used.**

**Standard: The mounting...shall be such that the bottom of the message sign shall be a minimum of 7 feet above the roadway when it is in the operating mode.**

Guidance: When PCMS are not being used...they should be relocated such that they are outside the clear zone or shielded... and turned away from traffic. If relocation or shielding is not practical, they should be delineated with retroreflective TTC devices.

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

An arrow board should be placed on the shoulder of the roadway or, if practical, farther from the traveled lane. It should be delineated with retroreflective TTC devices. When it 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: An arrow board in the arrow or chevron mode shall be used only for stationary or moving lane closures on multi-lane roadways.**

**Arrow boards shall not be used to indicate a lane shift.**

**Standard: All channelizing devices shall be crashworthy.**

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

**Where channelizing devices are used to channelize pedestrians, there shall be continuous detectable bottom and top surfaces...**

**The bottom of the bottom surface shall be no higher than 2 inches above the ground. The top of the top surface shall be no lower than 32 inches above the ground.**

## **Notes for Figure 6F-6 – Advance Warning Arrow Board Display Specifications**

**Standard:** Warning lights shall flash when placed on channelizing devices used alone or in a cluster... Except for sequential flashing warning lights...warning lights placed on channelizing devices used in a series to channelize road users shall be steady-burn.











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...retroreflectivity...shall be replaced.

**Standard:** ...cones shall be not less than 18 inches in height. When cones are used on freeways and other high-speed highways or at night on all highways, cones shall be a minimum of 28 inches in height.

Retroreflectorization of cones that are more than 36 inches in height shall be provided by... alternating orange and white retroreflective stripes... Each cone shall have a minimum of two orange and two white stripes with the top stripe being orange.

**Figure 6F-6. Advance Warning Arrow Board Display Specifications**

Operating Mode	Display (Type C arrow board illustrated) (right arrow shown; left is similar)		
1. At least one of the three following modes shall be provided:			
Flashing Arrow	 Merge Right		
Sequential Arrow			 Merge Right
Sequential Chevron			 Merge Right
2. The following mode shall be provided: Flashing Double Arrow	 Merge Right or Left		
3. At least one of the following modes shall be provided: Flashing Caution or Alternating Diamond Caution	 Flashing Caution	or	 Alternating Diamond Caution

Arrow Board Type	Minimum Size	Minimum Legibility Distance	Minimum Number of Elements
A	48 x 24 inches	1/2 mile	12
B	60 x 30 inches	3/4 mile	13
C	96 x 48 inches	1 mile	15
D	None*	1/2 mile	12

\*Length of arrow equals 48 inches, width of arrowhead equals 24 inches

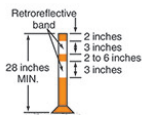
**Standard: vertical panels shall be...at least 24 inches in height. They shall have alternating diagonal orange and white retroreflective stripes sloping downward at an angle of 45 degrees in the direction vehicular traffic is to pass.**

**Standard: Drums...shall be a minimum of 36 inches in height...Metal drums shall not be used. . . Each drum shall have a minimum of two orange and two white stripes, with the top stripe being orange.**

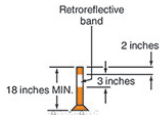
Figure 6F-7. Channelizing Devices  
(Sheet 1 of 2)



**DRUM**  
\* Warning lights (optional)

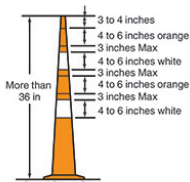


Night and/or freeway  
High-speed roadway  
( $\geq 45$  mph)

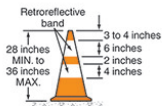


Day and low-speed  
roadway ( $\leq 40$  mph)

**TUBULAR MARKERS**



Min. 4 Retroreflective Bands  
(2 white and 2 orange)

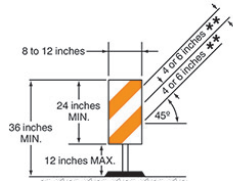


Night and/or freeway  
High-speed roadway  
( $\geq 45$  mph)



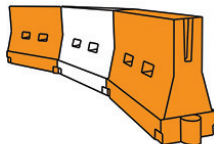
Day and low-speed  
roadway ( $\leq 40$  mph)

**CONES**



**VERTICAL PANEL**

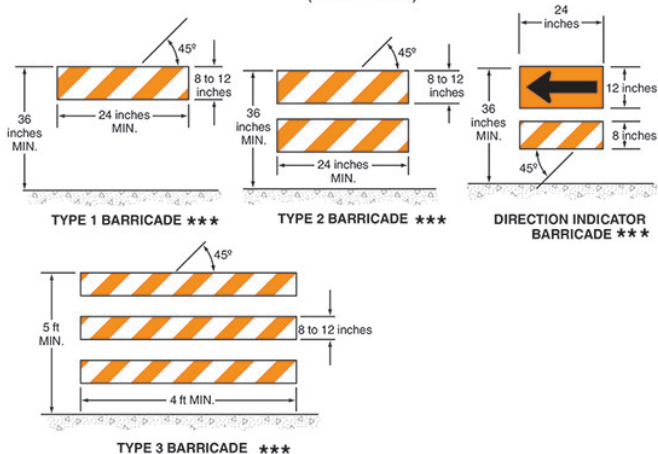
\*\* See Section 6F.66 for stripe width



**LONGITUDINAL CHANNELIZING  
DEVICE**



Figure 6F-7. Channelizing Devices  
(Sheet 2 of 2)



\*\*\* Rail stripe widths shall be 6 inches, except that 4-inch wide stripes may be used if rail lengths are less than 36 inches. The sides of barricades facing traffic shall have retroreflective rail faces.

**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...

**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 for 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 continuously or intermittently (stopping up to approximately 15 minutes)**

**Standard: Since long-term (*and intermediate-term*) operations extend into nighttime, retroreflective and/or illuminated devices shall be used...**

Support: The choice of TTC needed for a TTC zone depends upon where the work is located...

- 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.

Guidance: When conditions are more complex, typical applications should be modified...by incorporating devices and practices...

- A. Additional devices
- B. Upgrading devices
- C. Improved geometrics (Page 647)
- D. Increased distances
- E. Lighting:
- F. Pedestrian routes and temporary facilities
- G. Bicycle Diversions and temporary facilities
























**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 5 foot candles can be adequate for general activities. An average horizontal luminance of 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 20 foot candles.

Support: In general, (*typical applications*) represent minimum solutions for the situations depicted. Except for the notes... information presented in the typical applications can generally be regarded as Guidance.

Table 6H-1 provides an Index to Typical Applications

**Table 6H-2. Meaning of Symbols on Typical Application Diagrams**

	Arrow board		Shadow vehicle
	Arrow board support or trailer (shown facing down)		Sign (shown facing left)
	Changeable message sign or support trailer		Surveyor
	Channelizing device		Temporary barrier
	Crash cushion		Temporary barrier with warning light
	Direction of temporary traffic detour		Traffic or pedestrian signal
	Direction of traffic		Truck-mounted attenuator
	Flagger		Type 3 barricade
	High-level warning device (Flag tree)		Warning light
	Longitudinal channelizing device		Work space
	Luminaire		Work vehicle
	Pavement markings that should be removed for a long-term project		

*(For all notes relating to Typical Applications, refer to the 2011 Texas Manual on Uniform Traffic Control Devices Revision 1, November 2012)*

**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.*

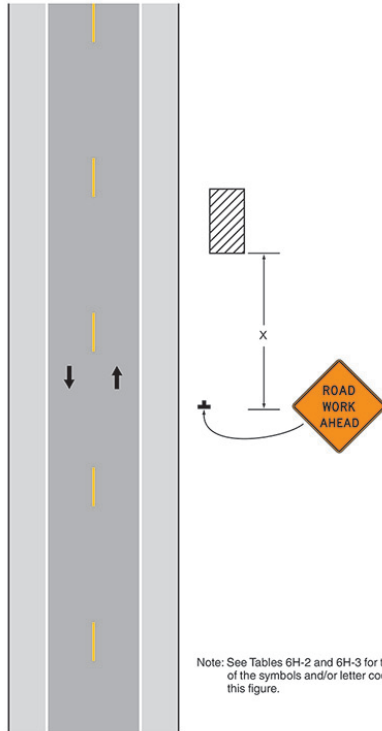
**Option:**

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 24 inches behind the curb, or 15 feet 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:**

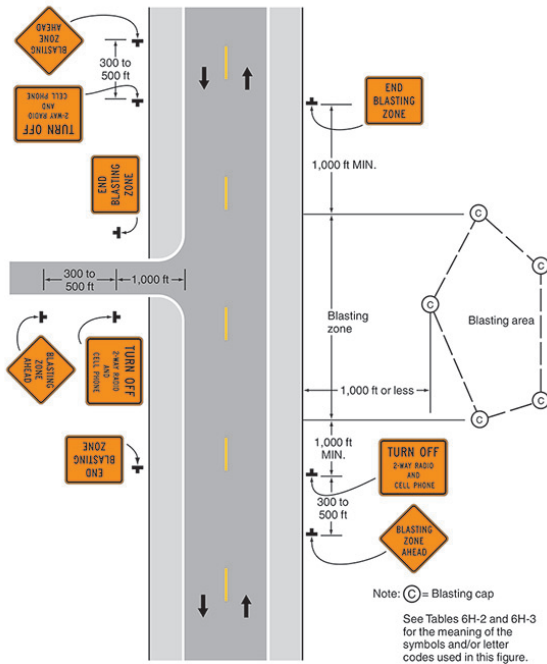
- 1. Whenever blasting caps are used within 1,000 feet of a roadway, the signing shown shall be used.**
- 2. The signs shall be covered or removed when there are no explosives in the area or the area is otherwise secure.**
- 3. Whenever a side road intersects the roadway between the BLASTING ZONE AHEAD sign and the END BLASTING ZONE sign, or a side road is within 1,000 feet 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)



Typical Application 2

**Notes for Figure 6H-3—Typical Application 3****Work on the Shoulders***Guidance:*

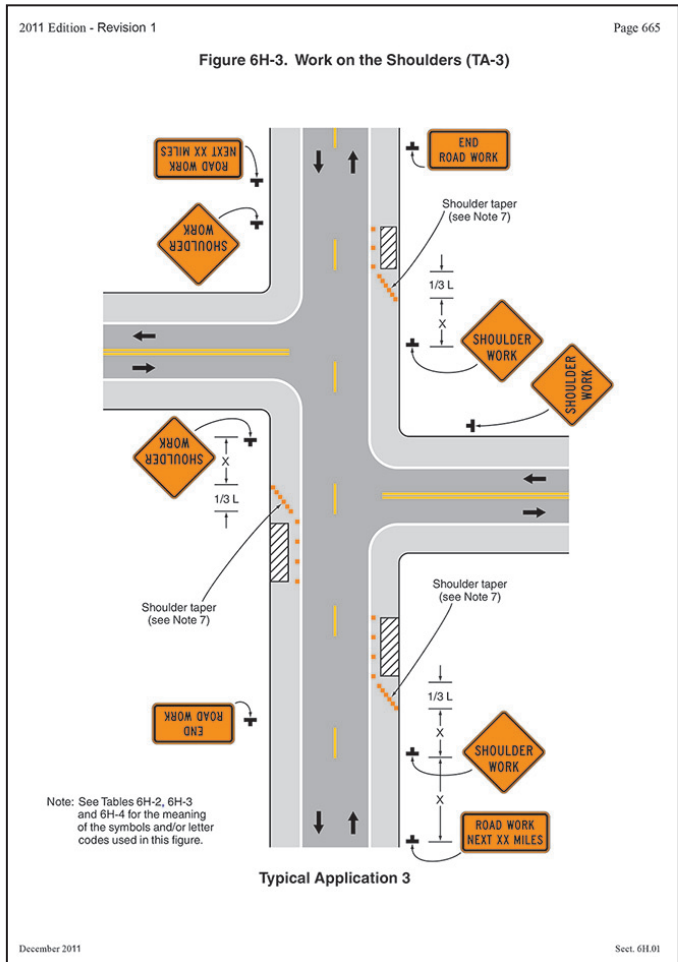
1. A *SHOULDER WORK* sign should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.

*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 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.**



### **Notes for Figure 6H-4—Typical Application 4 Short Duration or Mobile Operation on a 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 5 miles.*
- 2. In those situations where the distance between the advance signs and the work is 2 miles to 5 miles, a Supplemental Distance plaque should be used with the ROAD WORK AHEAD sign.*

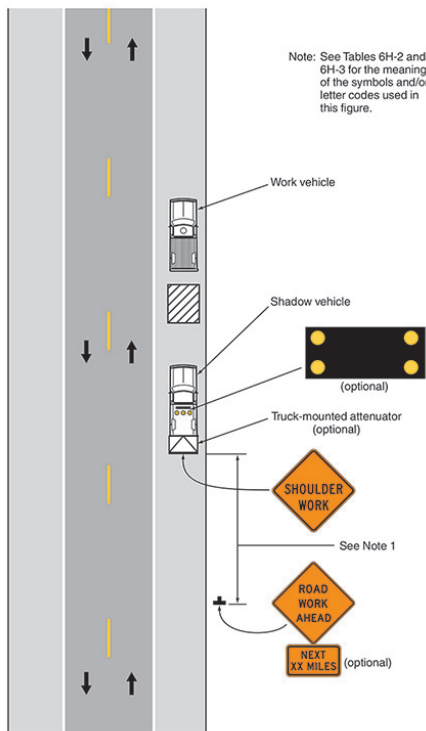
*Option:*

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 2 miles.
4. Stationary warning signs may be omitted for short duration or mobile operations if the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights.
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 board is used for an operation on the shoulder, the caution mode shall be used.**
- 8. 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.**

Figure 6H-4. Short-Duration or Mobile Operation on a Shoulder (TA-4)



Typical Application 4

**Notes for Figure 6H-5—Typical Application 5**  
**Shoulder Closure on a 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 feet or miles, as appropriate.
3. The use of a temporary traffic barrier should be based on engineering judgment.

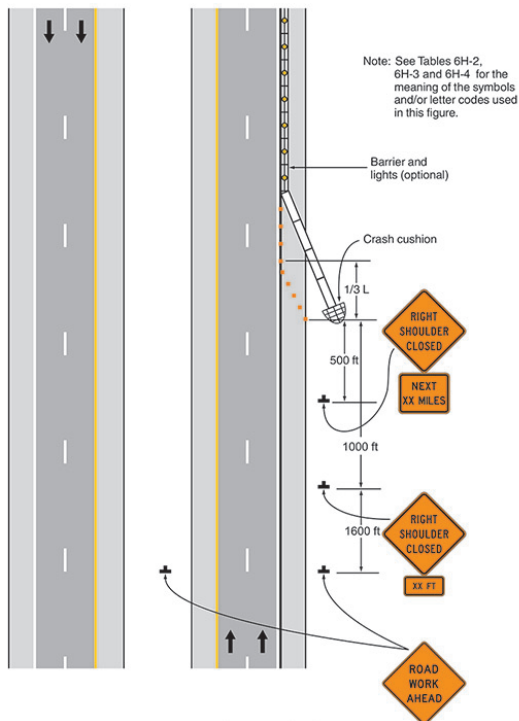
**Standard:**

4. **Temporary traffic barriers, if used, shall comply with the provisions of Section 6F.85.**

**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 or reflectors shown on the barrier may be used.

Figure 6H-5. Shoulder Closure on a Freeway (TA-5)



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 10 feet 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:*

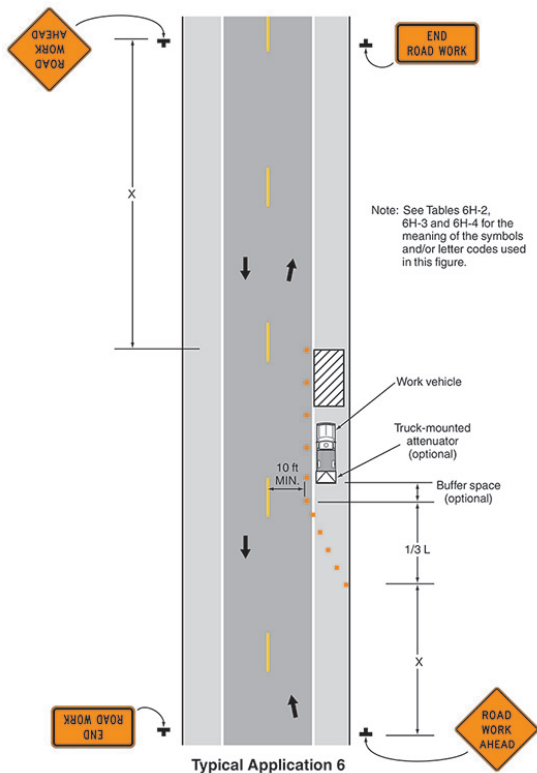
3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 9 feet may be used.
4. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely-spaced channelizing devices, provided that the minimum lane width of 10 feet 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-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.**
12. **Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.**
13. **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)



**Notes for Figure 6H-7—Typical Application 7**  
**Road Closure with a 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 to the traffic pattern of the roadway shall be removed or obliterated before any new traffic patterns are open to traffic.**
4. **Temporary barriers and end treatments shall be crashworthy.**

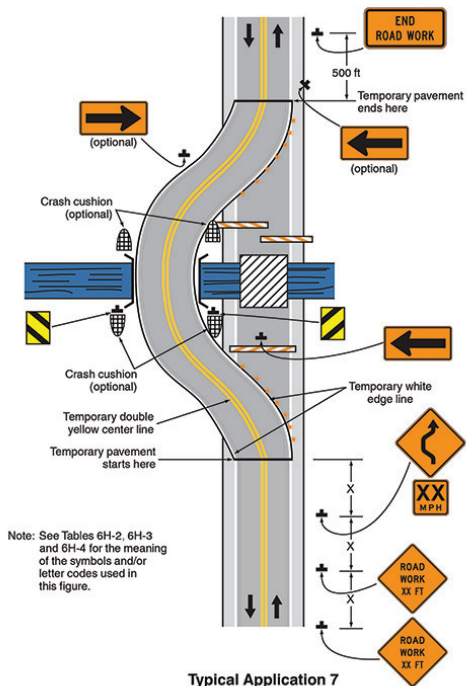
Guidance:

5. *If the tangent distance along the temporary diversion is more than 600 feet, 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 600 feet, and the diversion has sharp curves with recommended speeds of 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.

Figure 6H-7. Road Closure with a Diversion (TA-7)



**Notes for Figure 6H-8—Typical Application 8**  
**Road Closure with an Off-Site Detour**

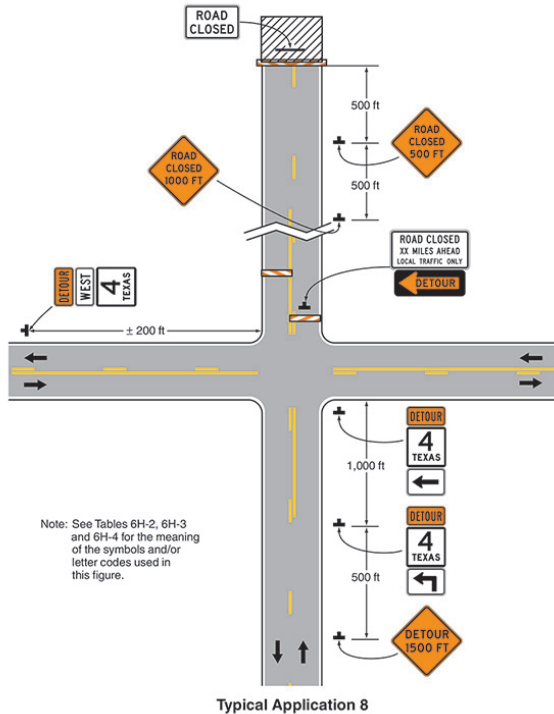
*Guidance:*

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 3 Barricades **should** be located at the edge of the traveled way.*

*Option:*

3. 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.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Cardinal direction plaques may be used with route signs.

Figure 6H-8. Road Closure with an Off-Site Detour (TA-8)



**Notes for Figure 6H-9—Typical Application 9**  
**Overlapping Routes with a 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 or YIELD signs displayed to side roads should be installed as needed along the temporary route.*

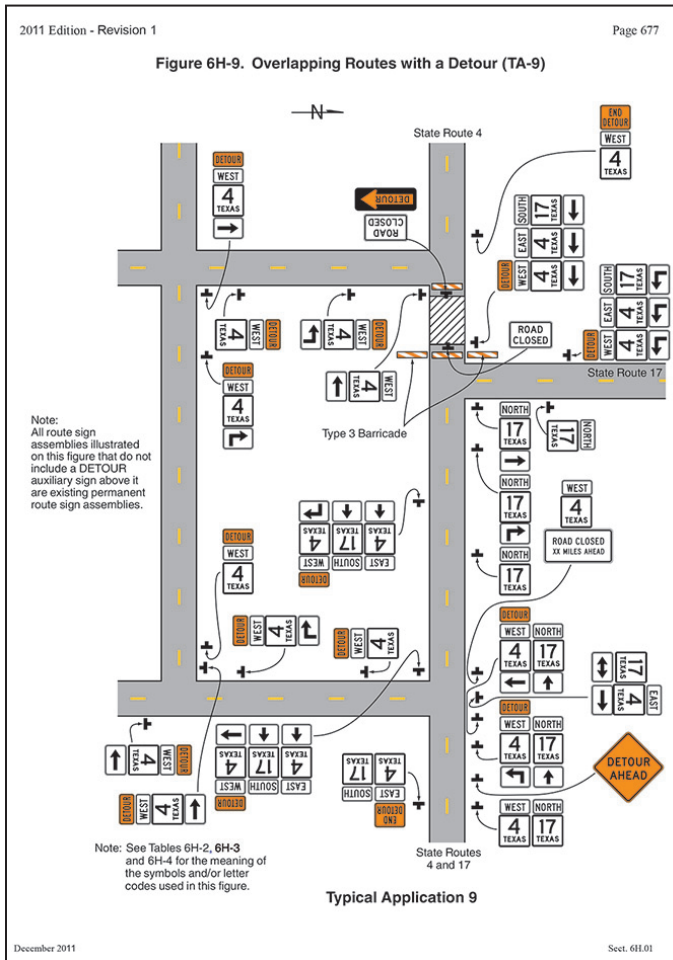
Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Deleted

*Guidance:*

- 6. Cardinal direction plaques should be used with route signs.*

Figure 6H-9. Overlapping Routes with a Detour (TA-9)



**Notes for Figure 6H-10—Typical Application 10**  
**Lane Closure on a 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 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 grade crossing, the TTC zone should be extended so that the transition area precedes the grade crossing.*
8. *When a 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 grade crossing exists within the activity area, drivers operating on the left-hand side of the normal center line should be provided with comparable warning devices as for drivers operating on the right-hand side of the normal center line.*
10. *Early coordination with the railroad company or light rail transit agency should occur before work starts.*

**Option:**

11. A flagger or a uniformed law enforcement officer may be used at the grade crossing to minimize the probability that vehicles are stopped within 15 feet of the grade crossing, measured from both sides of the outside rails.

**Guidance:**

12. *Access should be controlled throughout the construction or maintenance work zone. Closure of all entering intersections within the zone should be considered. Driveways create a problem that should be monitored by flaggers. Flaggers should have good visual contact or two-way radio contact with each other.*
13. *Length of work area should be based on the ability of flaggers to communicate.*

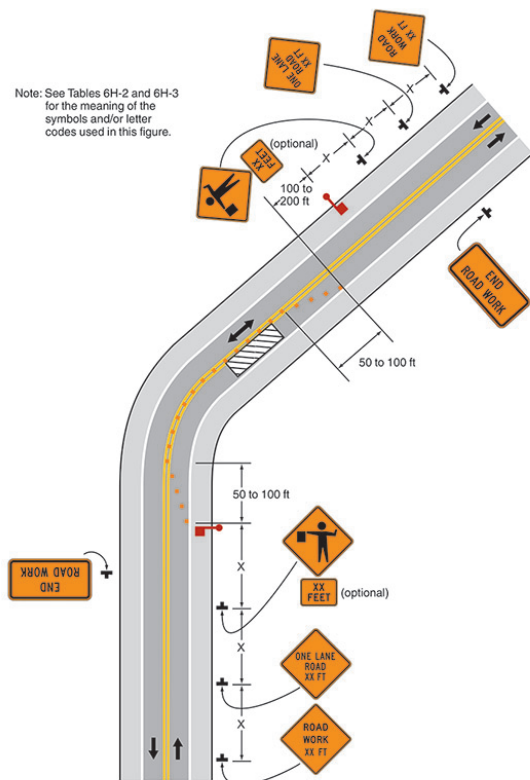
**Support:**

14. Additional requirements for the location of flaggers stations are contained in section 6E.08



Figure 6H-10. Lane Closure on a 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.



Typical Application 10

**Notes for Figure 6H-11—Typical Application 11****Lane Closure on a 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 worksite 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.

**Guidance:**

3. *The location of the yield bar should be selected using the same considerations as those applying to a flagger station (See section 6E.08, paragraphs 01-03).*



**Notes for Figure 6H-12—Typical Application 12****Lane Closure on a Two-Lane Road Using Traffic Control Signals****Standard:**

1. Temporary traffic control signals shall be installed and operated in accordance with the provisions of Part 4. Temporary traffic control signals shall meet the physical display and operational requirements of conventional traffic control signals.
2. Temporary traffic control 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 temporary traffic control 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 temporary traffic control 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 temporary traffic control 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.

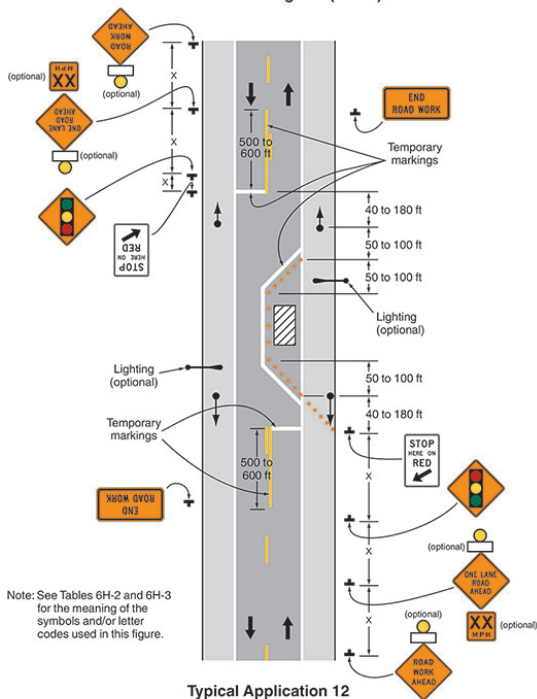
**Support:**

10. Temporary traffic control 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 temporary traffic control signal control is determined by the capacity required to handle the peak demand.

*Guidance:*

12. *The location of the stop bars should be selected using the same considerations as those applying to a flagger station (See section 6E.08, paragraphs 01-03).*

Figure 6H-12. Lane Closure on a Two-Lane Road Using Traffic Control Signals (TA-12)



**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 provided in Sections 6E.07 and 6E.08.**

*Guidance:*

- 3. The uniformed law enforcement officer, if used for this application, should follow the procedures provided in Sections 6E.07 and 6E.08.*

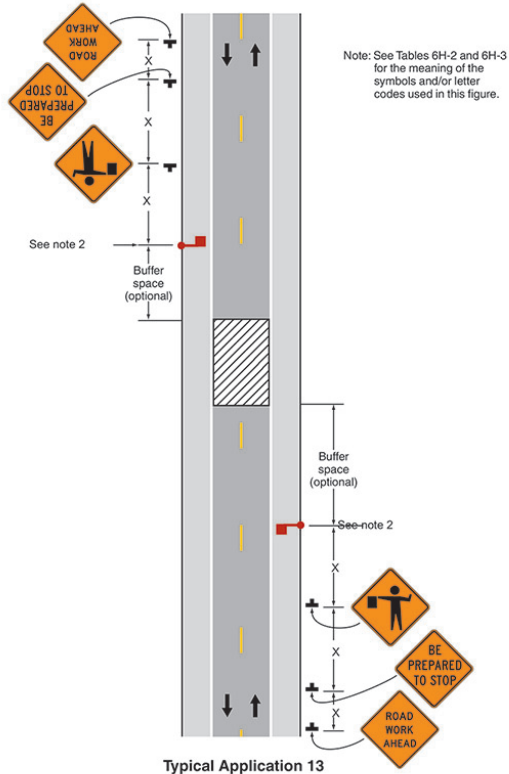
**Standard:**

- 4. A BE PREPARED TO STOP sign shall be located before the Flagger symbol sign.**

Support:

5. Additional requirements for the location of flagger stations are contained in section 6E.08.

Figure 6H-13. Temporary Road Closure (TA-13)



**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 3 Barricades and the Flagger symbol signs covered.**

5. **The flagger shall follow the procedures provided in Sections 6E.07 and 6E.08.**

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, the haul road shall be closed with Type 3 Barricades. 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 temporary traffic control 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 temporary traffic control signals.**

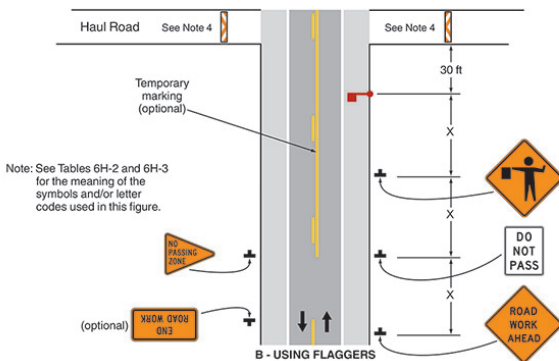
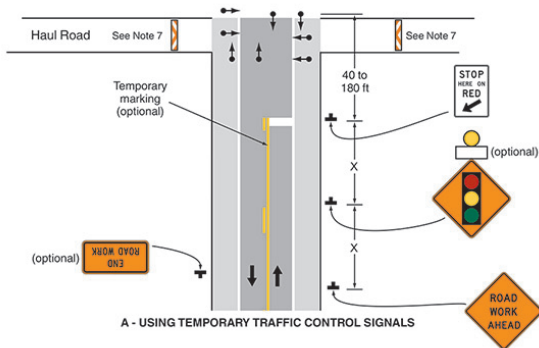
10. **Existing conflicting pavement markings between the stop lines shall be removed. After the temporary traffic control signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.**

**Support:**

11. **Additional requirements for the location of flagger stations are contained in section 6E.08.**



Figure 6H-14. Haul Road Crossing (TA-14)



Typical Application 14

**Notes for Figure 6H-15—Typical Application 15**  
**Work in the Center of a Road with Low Traffic Volumes**

*Guidance:*

1. *The lanes on either side of the center work space should have a minimum width of 10 feet as measured from the near edge of the channelizing devices to the edge of the pavement or the outside edge of the paved shoulder.*

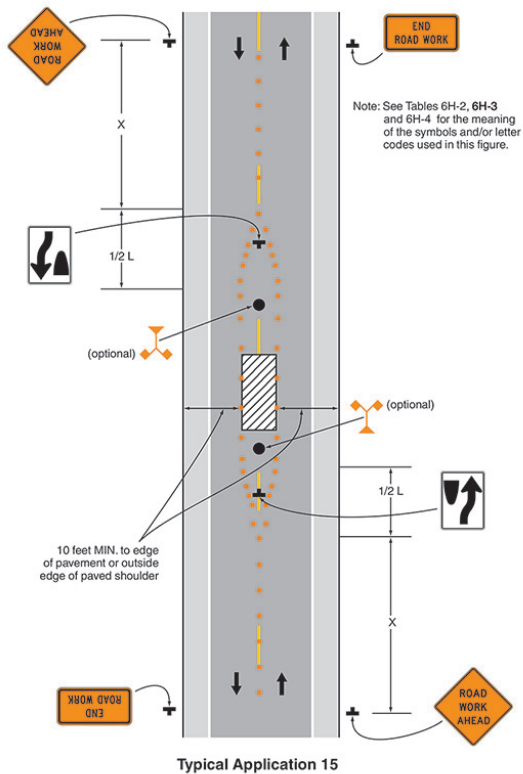
*Option:*

2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
3. If the closure continues overnight, warning lights may be used on the channelizing devices.
4. A lane width of 9 feet 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.
5. 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.
6. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

**Standard:**

**7. 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 the Center of a Road with Low Traffic Volumes (TA-15)



### Notes for Figure 6H-16—Typical Application 16

#### Surveying Along the Center Line of a Road with Low Traffic Volumes

*Guidance:*

1. The lanes on either side of the center work space should have a minimum width of 10 feet as measured from the near edge of the channelizing devices to the edge of the pavement or the outside edge of the paved shoulder.
2. Cones should be placed 6 to 12 inches on either side of the center line.
3. A flagger should be used to warn workers who cannot watch road users.

**Standard:**

4. For surveying on the center line of a high-volume road, one lane shall be closed using the information illustrated in Figure 6H-10.

*Option:*

5. A high-level warning device may be used to protect a surveying device, such as a target on a tripod.
6. Cones may be omitted for a cross-section survey.
7. ROAD WORK AHEAD signs may be used in place of the SURVEY CREW AHEAD signs.
8. Flags may be used to call attention to the advance warning signs.
9. If the work is along the shoulder, the flagger may be omitted.
10. For a survey along the edge of the road or along the shoulder, cones may be placed along the edge line.
11. A BE PREPARED TO STOP sign may be added to the sign series.

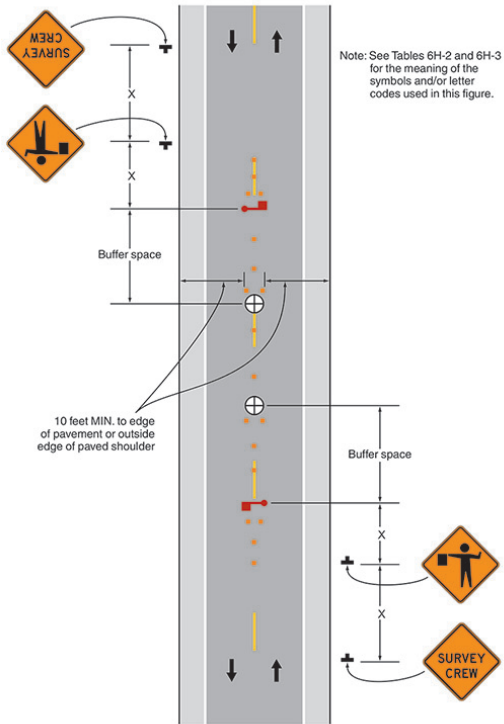
*Guidance:*

12. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.

**Support:**

13. Additional requirements for the location of flagger stations are contained in section 6E.08.

Figure 6H-16. Surveying Along the Center Line of a Road with Low Traffic Volumes (TA-16)



Typical Application 16

**Notes for Figure 6H-17—Typical Application 17**  
**Mobile Operations on a 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 board is used, it shall be used in the caution mode.
  - 3A. When the X VEHICLE CONVOY (CW21-10bT) sign is used, it shall have the number of convoy vehicles displayed in the number designation “X” location.

*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 if they are located on the shoulder rather than in the travel lane.
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.

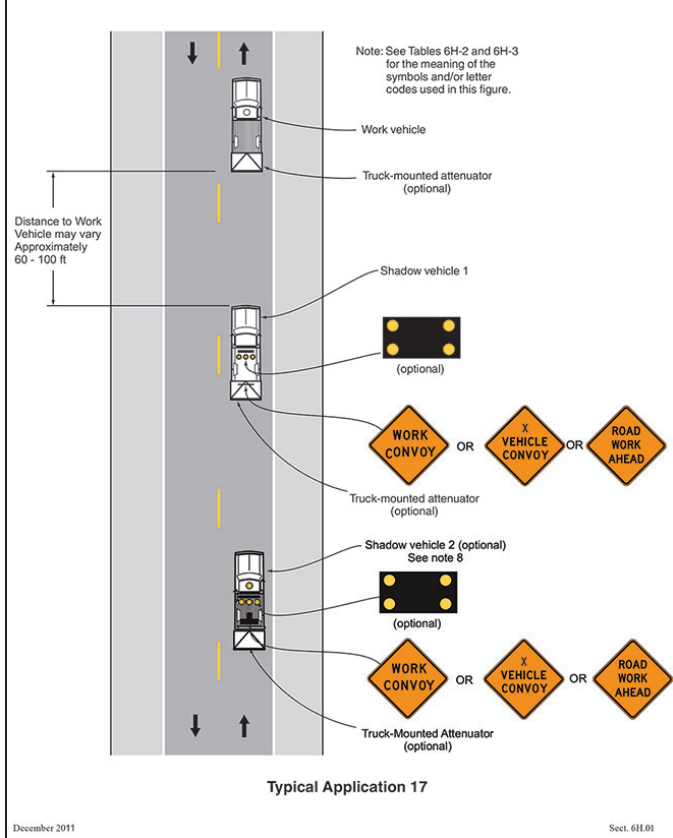
**Support:**

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 a Two-Lane Road (TA-17)



**Notes for Figure 6H-18—Typical Application 18**  
**Lane Closure on a 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

## Support:

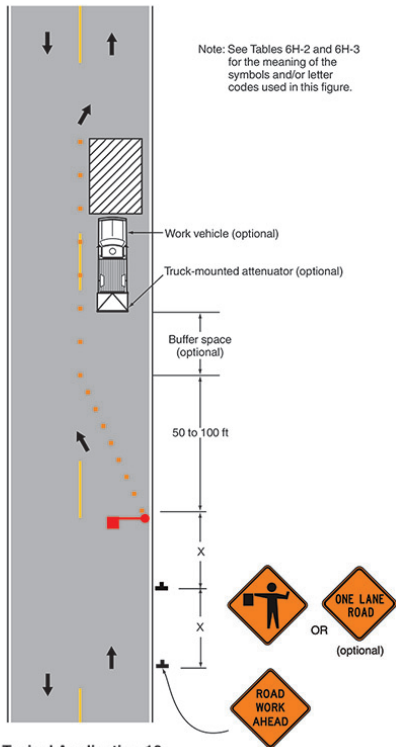
6. Additional requirements for the location of flagger stations are contained in section 6E.08.



Figure 6H-18. Lane Closure on a Minor Street (TA-18)

Note: Warning signs sequence in this direction same as below

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-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. Deleted
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.**



**Notes for Figure 6H-20—Typical Application 20**  
**Detour for a 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:*

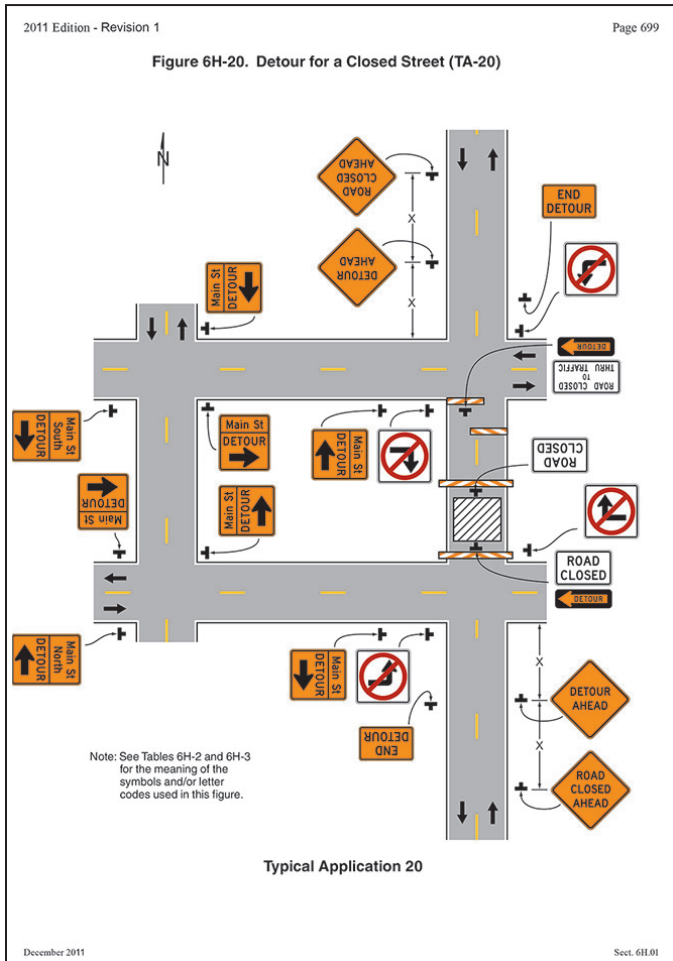
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. Deleted
5. Detour signs may be located on the far side of intersections. A Detour sign with an advance arrow may be used in advance of a turn.
6. A Street Name sign may be mounted with the Detour sign. 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.



**Notes for Figure 6H-21—Typical Application 21**  
**Lane Closure on the Near Side of an Intersection**

**Standard:**

- 1. The merging taper shall direct vehicular traffic into either the right-hand or left-hand 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 motor vehicle 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.*

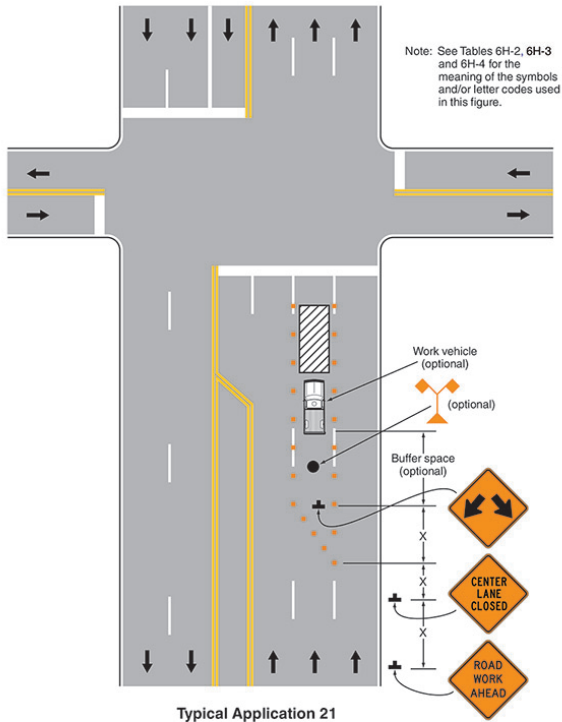
**Option:**

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.
- 7A. The “LANE BLOCKED” (CW20-6T) sign with an X under the appropriate lane number may be used in place of the CENTER LANE CLOSED (CW9-3T) sign when there are more than three through lanes in the direction of the lane closure.

**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 the Near Side of an Intersection (TA-21)



**Notes for Figure 6H-22—Typical Application 22**  
**Right-Hand Lane Closure on the Far Side of an Intersection**

*Guidance:*

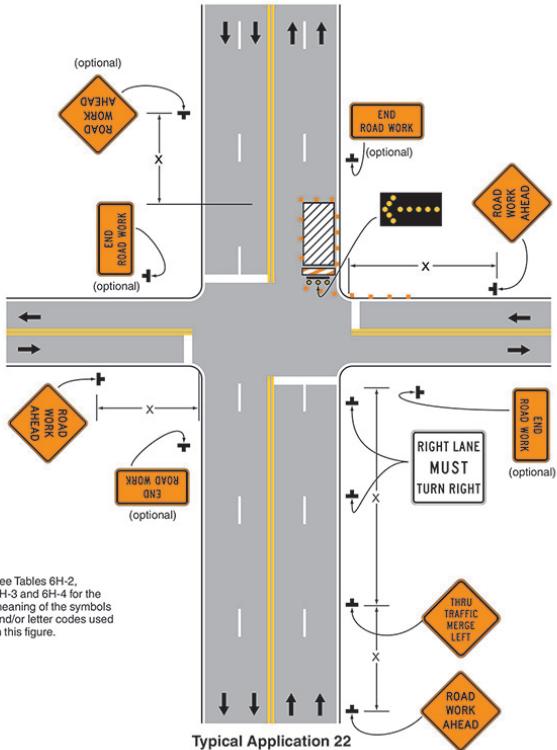
1. *If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.*

*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-hand lane having significant right turning movements, then the right-hand 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-Hand Lane Closure on the Far Side of an Intersection (TA-22)



Note: See Tables 6H-2, 6H-3 and 6H-4 for the meaning of the symbols and/or letter codes used in this figure.

**Notes for Figure 6H-23—Typical Application 23****Left-Hand Lane Closure on the Far Side of an 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.*

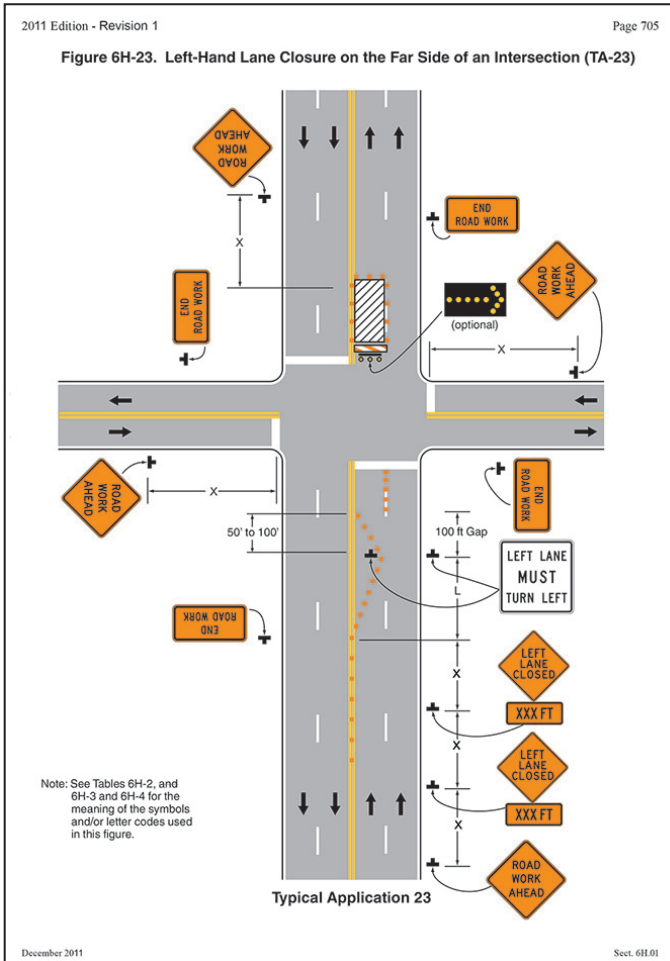
## Option:

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.  
3A. For Short-Term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a supplemental plaque.

## Support:

4. By first closing off the left lane and then reopening it as a turn bay, the left-turn bay allows storage of turning vehicles so that the movement of through traffic is not impeded. A left-turn bay that is long enough to accommodate all turning vehicles during a traffic signal cycle will provide the maximum benefit for through traffic. Also, 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-Hand Lane Closure on the Far Side of an Intersection (TA-23)



**Notes for Figure 6H-24—Typical Application 24**  
**Half Road Closure on the Far Side of an 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.*
3. *A buffer space **should** be used between opposing directions of vehicular traffic as shown in this application.*

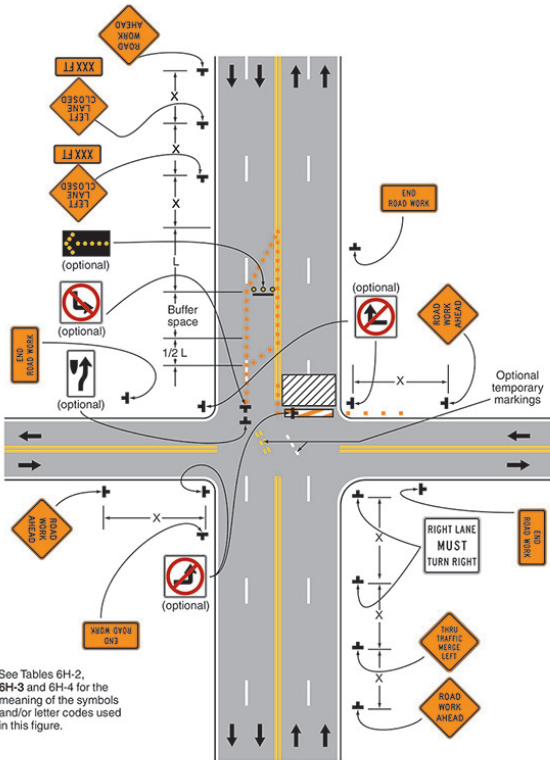
*Option:*

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-hand 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.
- 9A. For Short-Term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a supplemental plaque.

*Support:*

10. Keeping the right-hand 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
12. See paragraph 06, Section 6G.13 for additional guidance when anticipated speeds exceed 40 mph.

Figure 6H-24. Half Road Closure on the Far Side of an Intersection (TA-24)



**Notes for Figure 6H-25—Typical Application 25**  
**Multiple Lane Closures at an 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.*

Support:

3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection.

Option:

4. 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.
5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.



## Notes for Figure 6H-26—Typical Application 26

### Closure in the Center of an Intersection

#### Guidance:

1. All lanes should be a minimum of 10 feet in width as measured to the near face of the channelizing devices.

#### Option:

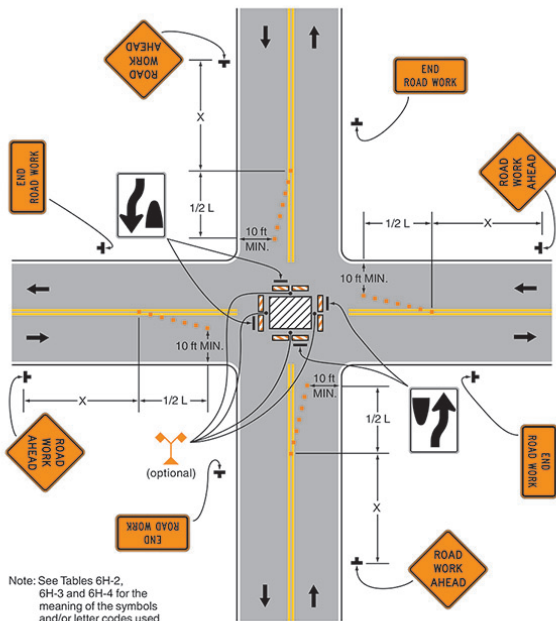
2. A high-level warning device may be placed in the work space, if there is sufficient room.
3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 9 feet may be used.
4. Flashing warning 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 the Center of an Intersection (TA-26)



Typical Application 26

**Notes for Figure 6H-27—Typical Application 27****Closure at the Side of an 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. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. 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.
6. A BE PREPARED TO STOP sign may be added to the sign series.

*Guidance:*

- 7. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.*
- 8. ONE LANE ROAD AHEAD signs should also be used to provide adequate advance warning.*

## 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.

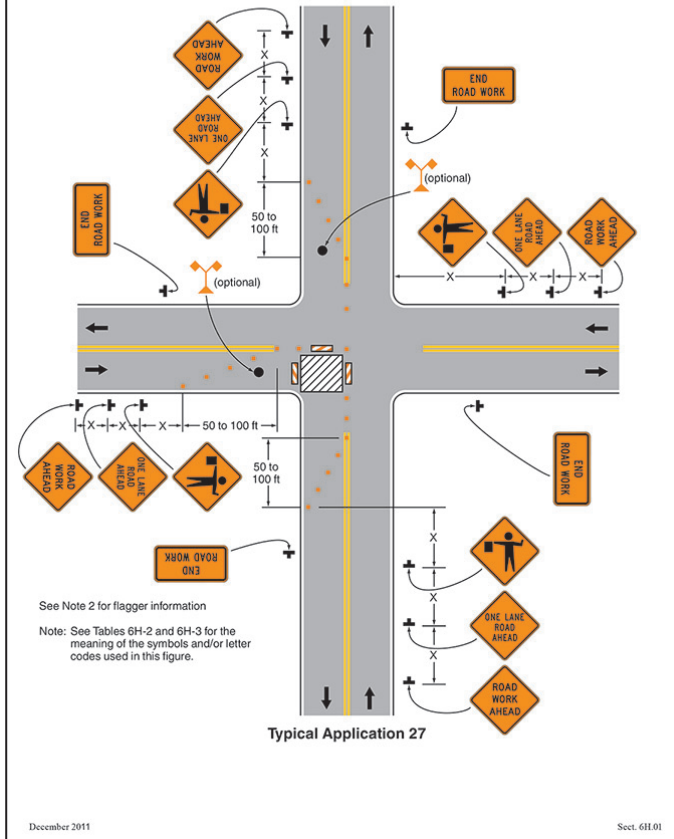
## Option:

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 the Side of an Intersection (TA-27)



**Notes for Figure 6H-28—Typical Application 28**  
**Sidewalk Detour or Diversion**

**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.

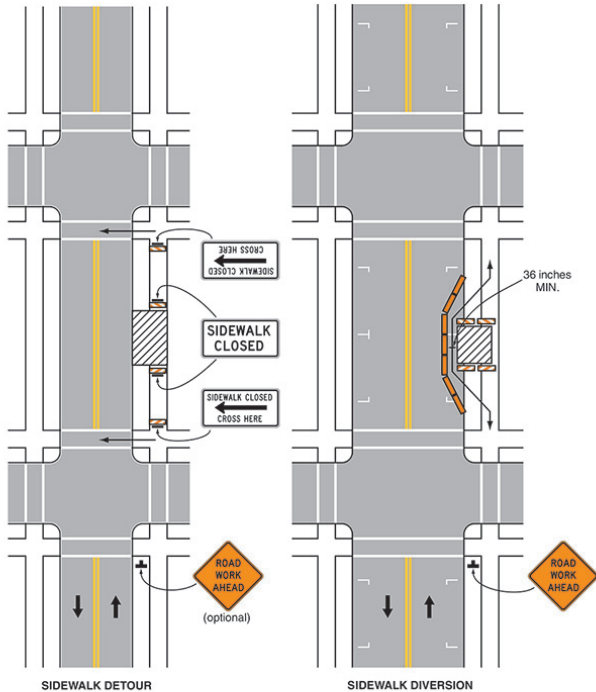
5. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.

6. Deleted

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.

**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 50 feet in advance of the midblock crosswalk.**

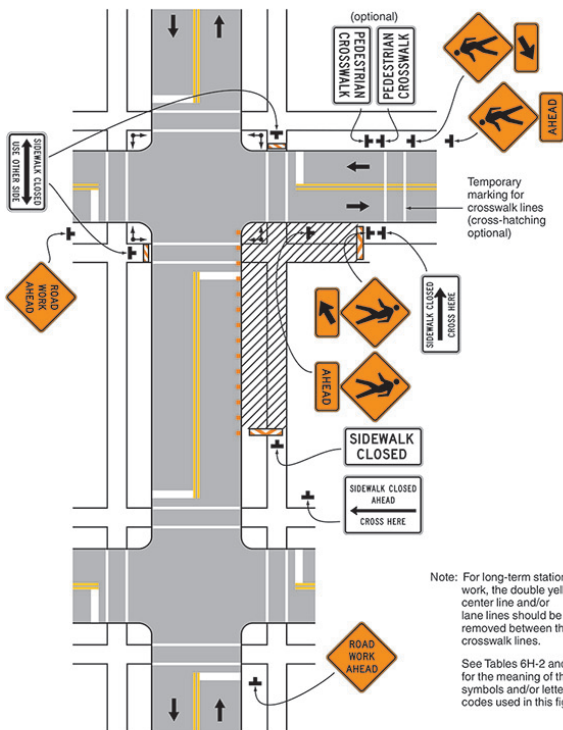
*Guidance:*

- 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. Deleted.
8. Type C Steady-Burn or Type D 360-degree 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 center line 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.

Typical Application 29

**Notes for Figure 6H-30—Typical Application 30**  
**Interior Lane Closure on a Multi-Lane Street**

*Guidance:*

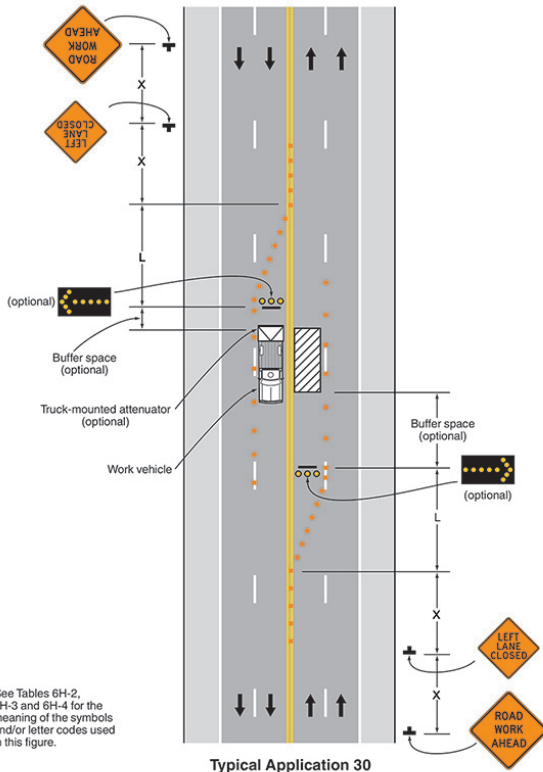
*1. This information applies to low-speed, low-volume urban streets. Where speed or volume is higher, additional signing such as LEFT LANE CLOSED XX FT should be used between the signs shown.*

*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.



Figure 6H-30. Interior Lane Closure on a Multi-Lane Street (TA-30)



**Notes for Figure 6H-31—Typical Application 31**  
**Lane Closure on a 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, an **additional LEFT LANE CLOSED sign with a distance plaque** should be added for vehicular traffic approaching the lane closure.*
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  $1/2 S$  feet where  $S$  is the speed in mph. Temporary markings should be installed where needed.*
5. *If the lane shift has curves with recommended speeds of 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 600 feet, 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.*

**Standard:**

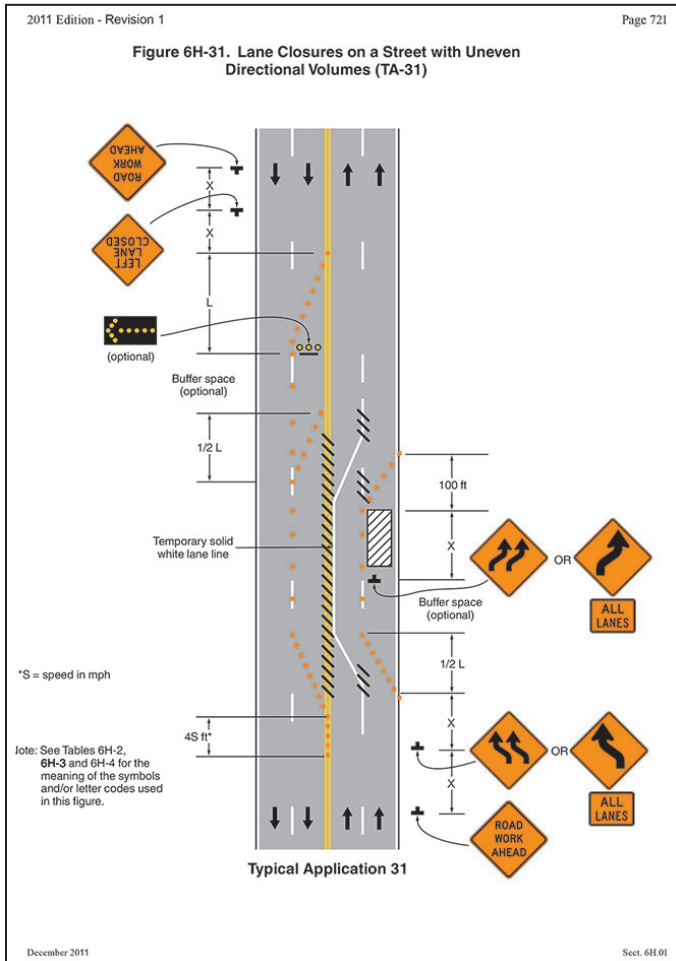
- 8. The number of lanes illustrated on the Reverse Curve or Double Reverse Curve signs shall be the same as the number of through lanes available to road users, and the direction of the reverse curves shall be appropriately illustrated.**

## Guidance:

9. *A longitudinal buffer space **should** be used in the activity area to separate opposing vehicular traffic.*

## Option:

10. Where two or more lanes are being shifted, a CW1-4 (or CW1-3) sign with an ALL LANES (CW24-1cP) plaque (see Figure 6F-4) may be used instead of a sign that illustrates the number of lanes.
11. Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.
12. A work vehicle or a shadow vehicle may be equipped with a truck-mounted attenuator.



**Notes for Figure 6H-32—Typical Application 32**  
**Half Road Closure on a 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 8 feet 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  $1/2 S$  feet where  $S$  is the speed in mph.*
- 4. If the tangent distance along the temporary diversion is less than 600 feet, a Double Reverse Curve sign should be used instead of the first Reverse Curve sign, and the second Reverse Curve sign should be omitted.*

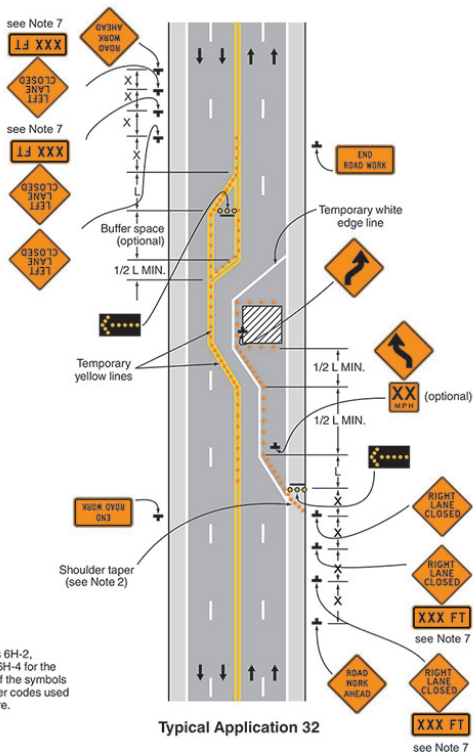
**Option:**

5. Warning lights may be used to supplement channelizing devices at night.
6. A truck-mounted attenuator may be used on the work vehicle and/or the shadow vehicle.
7. For Short-Term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a supplemental plaque.

*Guidance:*

- 8. A buffer space should be used between opposing directions of vehicular traffic as shown in this application.*

Figure 6H-32. Half Road Closure on a Multi-Lane, High-Speed Highway (TA-32)



Note: See Tables 6H-2, 6H-3 and 6H-4 for the meaning of the symbols and/or letter codes used in this figure.

**Notes for Figure 6H-33—Typical Application 33  
Stationary Lane Closure on a 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 8 feet 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.
- 4A. For Short-Term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a supplemental plaque.

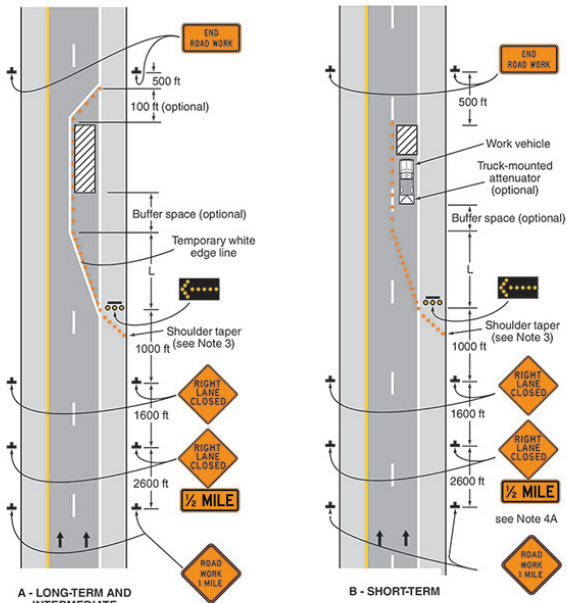
*Support:*

5. Where conditions permit, restricting all vehicles, equipment, workers, and their activities to one side of the roadway might be advantageous.

**Standard:**

- 6. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

Figure 6H-33. Stationary Lane Closure on a Divided Highway (TA-33)



Note: See Tables 6H-2, 6H-3 and 6H-4 for the meaning of the symbols and/or letter codes used in this figure.

Typical Application 33

**Notes for Figure 6H-34—Typical Application 34**  
**Lane Closure with a 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 upstream end of the merging taper to the downstream 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. Temporary traffic barriers, if used, shall comply with the provisions of Section 6F.85.
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. 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.
7. 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 non-work periods or peak-period vehicular traffic conditions, as appropriate.

**Standard:**

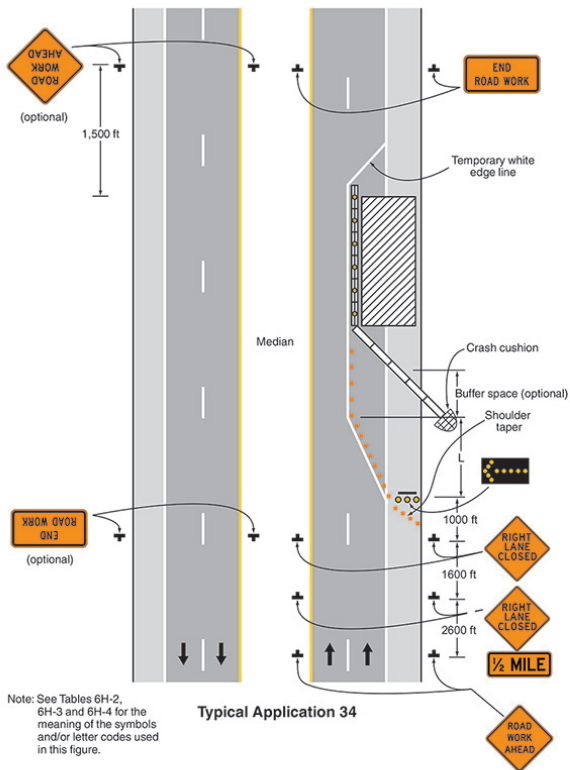
8. If a movable barrier is used, the temporary white edge line shown in the typical application shall not be used. During the period when the right-hand lane is opened, the sign legends and the channelization shall be changed to indicate that only the shoulder is closed, as illustrated in Figure 6H-5. The arrow board, if used, shall be placed at the downstream 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 a Temporary Traffic Barrier (TA-34)



## Notes for Figure 6H-35—Typical Application 35

## Mobile Operation on a Multi-Lane Road

## Standard:

1. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
2. 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.
3. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.
4. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
- 4A. When the X VEHICLE CONVOY (CW21-10bT) sign is used, it shall have the number of convoy vehicles displayed in the number designation "X" location. This number does not include advance warning shadow vehicles located on the shoulder in advance of the X VEHICLE CONVOY sign.

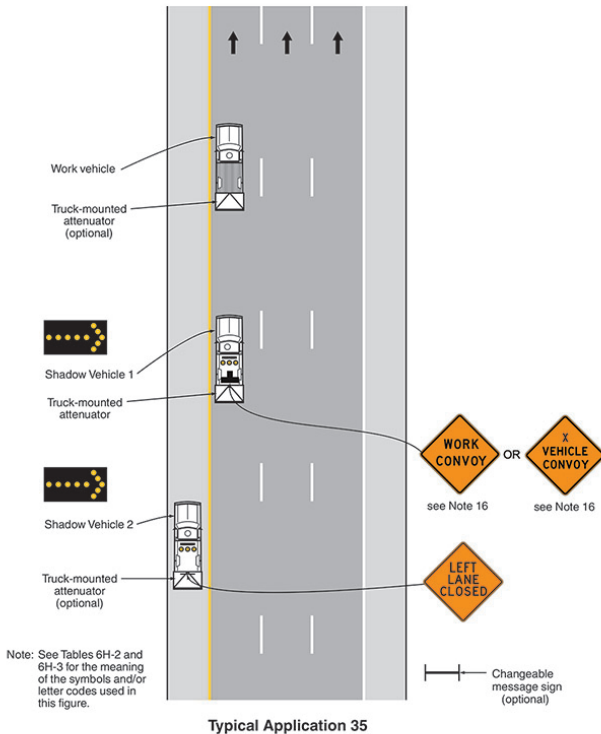
## Guidance:

5. Vehicles used for these operations should be made highly visible with appropriate equipment, such as flags, signs, or arrow boards.
6. Shadow Vehicle 1 should be equipped with an arrow board and truck-mounted attenuator.
7. Shadow Vehicle 2 should be equipped with an arrow board. An appropriate lane closure sign should be placed on Shadow Vehicle 2 so as not to obscure the arrow board.
8. 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.
9. 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.
10. Work should normally be accomplished during off-peak hours.
11. 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-hand shoulder 10 feet or more in width, Shadow Vehicle 2 should drive the right-hand shoulder with a sign indicating that work is taking place in the interior lane.
- 11A. For divided highways with two or three lanes in the direction of the mobile operation, the appropriate LEFT LANE CLOSED (CW20-5TL), RIGHT LANE CLOSED (CW20-5TR) or CENTER LANE CLOSED (CW9-3T) should be placed on Shadow Vehicle 2. For divided highways with four or more lanes in the direction of the mobile operation, the LANE BLOCKED (CW20-6T) sign with an "X" under the appropriate closed lane number should be placed on Shadow Vehicle 2.

## Option:

12. A truck-mounted attenuator may be used on Shadow Vehicle 2.
13. 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.
14. Where adequate shoulder width is not available, Shadow Vehicle 3 may also straddle the edge line.
15. A Portable Changeable Message sign with a minimum character height of 10 inches may be mounted on Shadow Vehicle 2 and substituted for the LEFT, RIGHT, or CENTER LANE CLOSED signs, displaying the same message as the sign it is replacing. An appropriate flashing arrow display may be alternated with this message.
16. Where limited mounting space on shadow vehicles between the arrow panel and the TMA justify a change from the standard diamond shape, rectangular versions of the WORK CONVOY (CW21-10aT) and X VEHICLE CONVOY (CW21-10bT or CW21-10cT) signs as shown in the Standard Highway Sign Designs for Texas may be used.

Figure 6H-35. Mobile Operation on a Multi-Lane Road (TA-35)



**Notes for Figure 6H-36—Typical Application 36**  
**Lane Shift on a Freeway**

**Guidance:**

1. *The lane shift should be used when the work space extends into either the right-hand or left-hand lane of a divided highway and it is not practical, for capacity reasons, to reduce the number of available lanes.*

**Support:**

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.

**Guidance:**

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. **Temporary traffic barriers, if used, shall comply with the provisions of Section 6F.85.**  
 5. **The barrier shall not be placed along the shifting taper. The lane shall first be shifted using channelizing devices and pavement markings.**

**Guidance:**

6. *A warning sign should be used to show the changed alignment.*

**Standard:**

7. **The number of lanes illustrated on the Reverse Curve signs shall be the same as the number of through lanes available to road users, and the direction of the reverse curves shall be appropriately illustrated.**

**Option:**

8. Where two or more lanes are being shifted, a CW1-4 (or CW1-3) sign with an ALL LANES (CW24-1cP) plaque (see Figure 6F-4) may be used instead of a sign that illustrates the number of lanes.  
 9. Where more than three lanes are being shifted, the Reverse Curve (or Turn) sign may be rectangular.

**Guidance:**

10. *Where the shifted section is longer than 600 feet, 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 600 feet, a Double Reverse Curve sign should be used instead of the first Reverse Curve sign, and the second Reverse Curve sign should be omitted.*  
 11. *If a STAY IN LANE sign is used, then solid white lane lines should be used.*

**Standard:**

12. **The minimum width of the shoulder lane shall be 10 feet.**  
 13. **For long-term stationary work, existing conflicting pavement markings shall be removed and temporary markings shall be installed before traffic patterns are changed.**

**Option:**

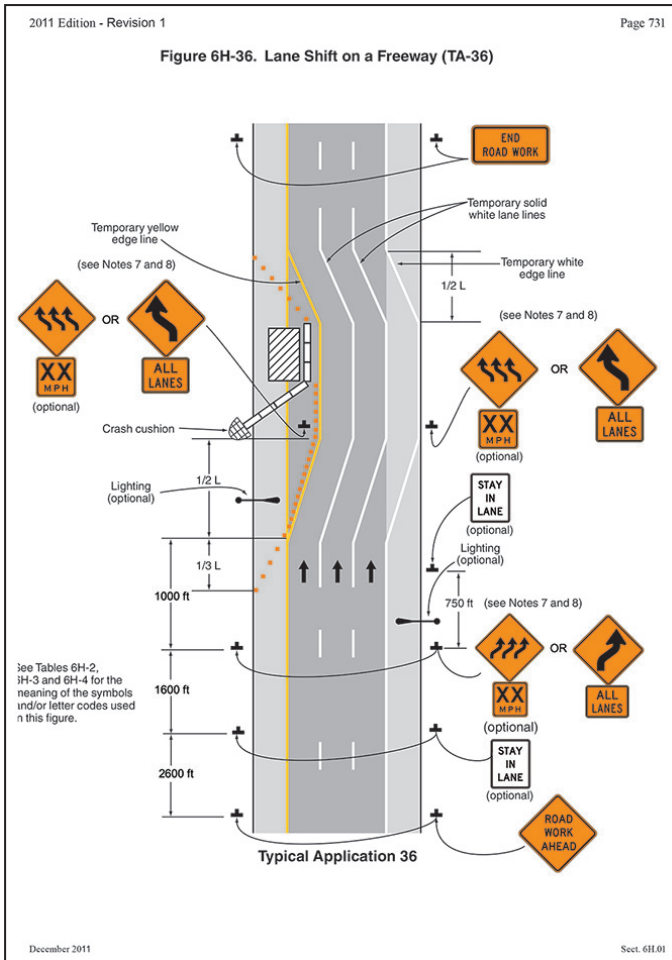
14. For short-term stationary work, lanes may be delineated by channelizing devices or removable pavement markings instead of temporary markings.

**Guidance:**

15. *If the shoulder cannot adequately accommodate trucks, trucks should be directed to use the travel lanes.*  
 16. *The use of a barrier should be based on engineering judgment.*

**Option:**

17. Type C Steady-Burn warning lights may be placed on channelizing devices and the barrier parallel to the edge of the pavement for nighttime lane closures.



**Notes for Figure 6H-37—Typical Application 37**  
**Double Lane Closure on a Freeway**

**Standard:**

- 1. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

*Guidance:*

- 2. Ordinarily, the preferred position for the second arrow board is in the closed exterior lane at the upstream end of the second merging taper. However, the second arrow board should be placed in the closed interior lane at the downstream 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 board 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 board; and*
  - c. When the first arrow board is placed in the closed exterior lane at the downstream end of the first merging taper (the alternative position when the shoulder is narrow).*

**Option:**

3. Flashing warning lights and/or flags may be used to call attention to the initial warning signs.
4. A truck-mounted attenuator may be used on the shadow vehicle.
5. If a paved shoulder having a minimum width of 10 feet 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-hand lane and a right-hand shoulder.

*Guidance:*

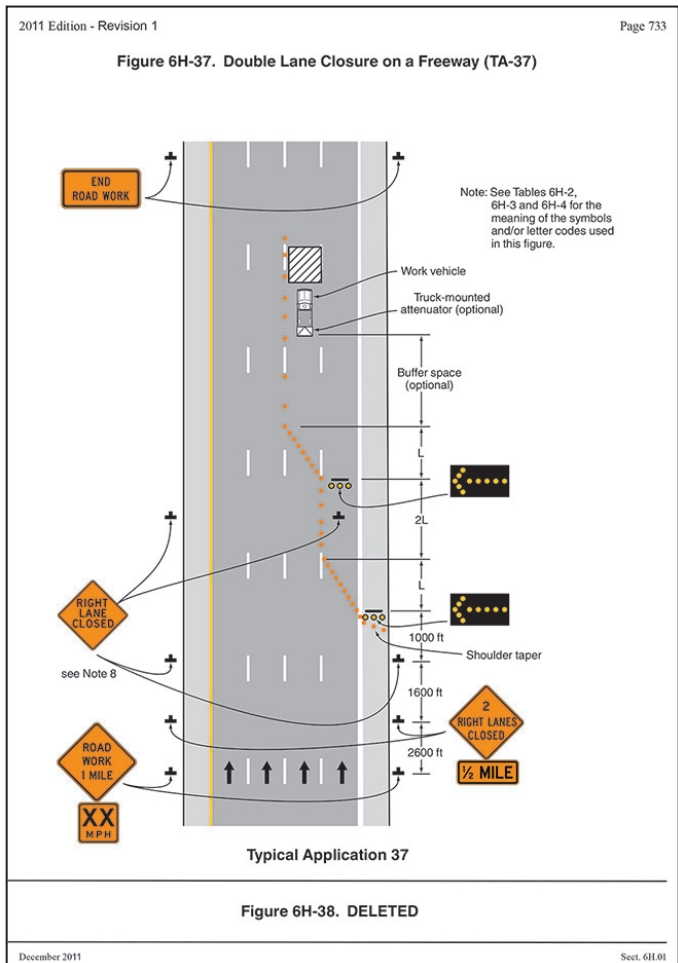
- 6. When a shoulder lane is used that cannot adequately accommodate trucks, trucks should be directed to use the normal travel lanes.*

**Option:**

7. For Short-Term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a supplemental plaque.
8. Distance plaques or Advisory Speed plaques may be added below the RIGHT/LEFT LANE CLOSED signs.

**Notes for Figure 6H-38—Typical Application 38**

**~~Interior Lane Closure on a Freeway~~ DELETED**



**Notes for Figure 6H-39—Typical Application 39****Median Crossover on a Freeway****Standard:**

- 1. Channelizing devices or temporary traffic barriers shall be used to separate opposing vehicular traffic.**
- 2. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

*Guidance:*

- 3. 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:**

4. 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.
5. The alignment of the crossover may be designed as a reverse curve.

*Guidance:*

- 6. When the crossover follows a curved alignment, the design criteria contained in the AASHTO "Policy on the Geometric Design of Highways and Streets" (see Section 1A.11) should be used.*
- 7. 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 feet of 2.0 times the speed limit in mph beyond the downstream end of the transition area as depicted.*
- 8. Where channelizing devices are used, the Two-Way Traffic signs should be repeated every 1 mile.*

**Option:**

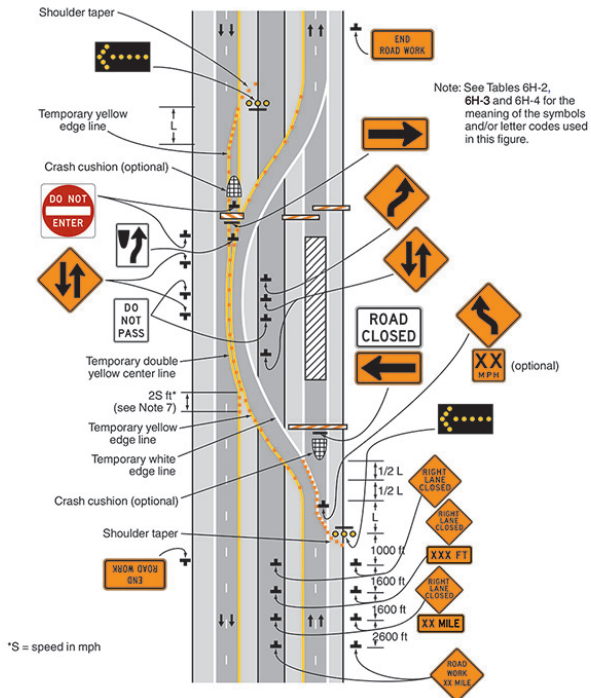
9. NEXT XX MILES Supplemental Distance plaques may be used with the Two-Way Traffic signs, where XX is the distance to the downstream end of the two-way section.

**Support:**

10. When the distance is sufficiently short that road users entering the section can see the downstream end of the section, they are less likely to forget that there is opposing vehicular traffic.
11. The sign legends for the four pairs of signs approaching the lane closure for the non-crossover 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 a Freeway (TA-39)



Typical Application 39

\*S = speed in mph

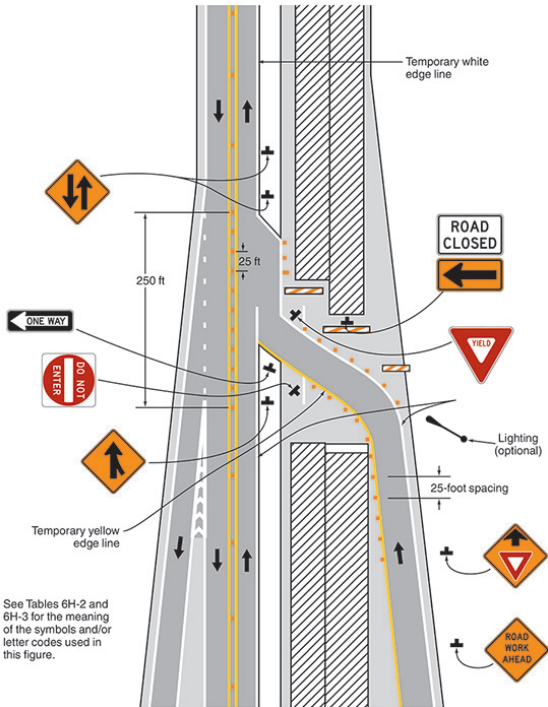
**Notes for Figure 6H-40—Typical Application 40****Median Crossover for an Entrance Ramp***Guidance:*

- 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 an acceptable gap, but should not be located so far forward that motorists will be encouraged to stop in the path of the mainline traffic. 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 an 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

**Notes for Figure 6H-41—Typical Application 41**  
**Median Crossover for an 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 sign panel should be placed diagonally across the interchange/intersection guide signs and channelizing devices should be placed to physically close the ramp.*
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.*

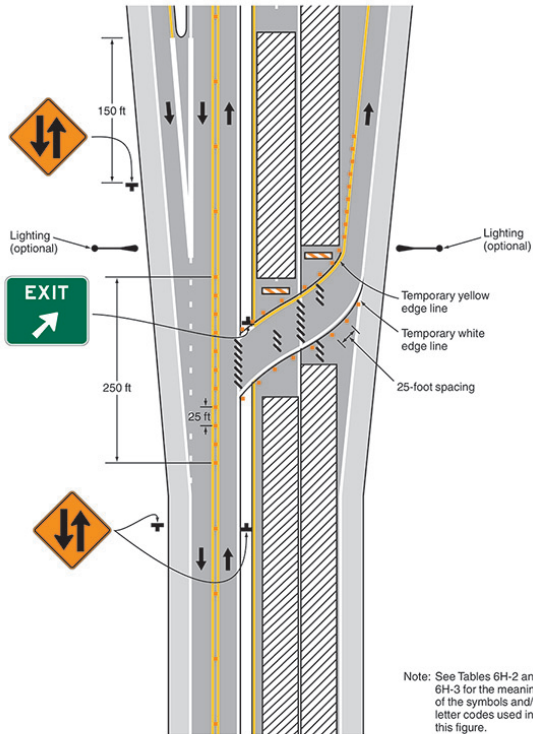
**Standard:**

6. **A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 7 feet 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.*
11. *Exit advisory speed signs and curve signs may be necessary for the exit ramp.*

Figure 6H-41. Median Crossover for an Exit Ramp (TA-41)



Typical Application 41

**Notes for Figure 6H-42—Typical Application 42****Work in the Vicinity of an 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 sign 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” (see Section 1A.11) should be used for determining the alignment.*

**Standard:**

- 4. A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 7 feet from the pavement surface to the bottom of the sign.**

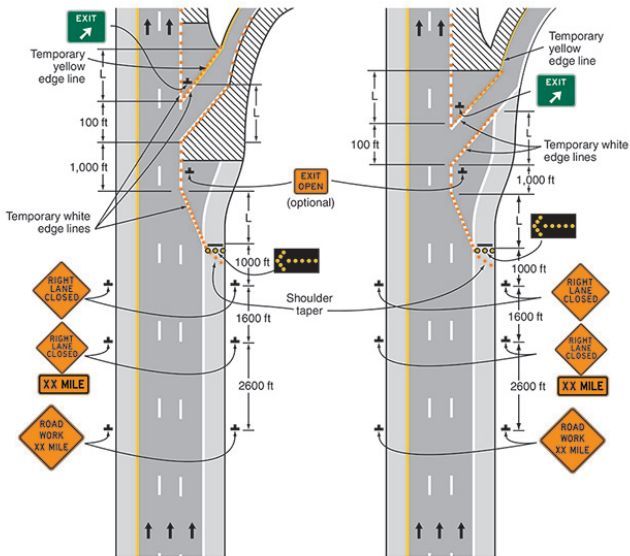
*Option:*

- 5. The temporary EXIT sign placed in the temporary gore may be either black on orange or white on green.*
- 6. An alternative procedure that may be used is to channelize exiting vehicular traffic onto the right-hand shoulder and close the lane as necessary.*
- 6A. For Short-Term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a supplemental plaque.*

**Standard:**

- 7. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

Figure 6H-42. Work in the Vicinity of an Exit Ramp (TA-42)



Typical Application 42

Note: See Tables 6H-2, 6H-3 and 6H-4 for the meaning of the symbols and/or letter codes used in this figure.

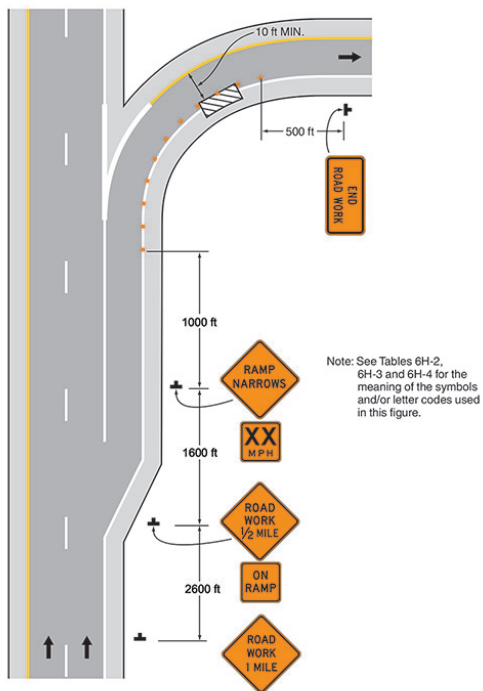
**Notes for Figure 6H-43—Typical Application 43**  
**Partial Exit Ramp Closure**

*Guidance:*

- 1. Truck off-tracking should be considered when determining whether the minimum lane width of 10 feet is adequate (see Section 6G.08).*



Figure 6H-43. Partial Exit Ramp Closure (TA-43)



Typical Application 43

**Notes for Figure 6H-44—Typical Application 44****Work in the Vicinity of an 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-hand 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 an acceptable gap in the mainline vehicular traffic flow, but should not be located so far forward that motorists will be encouraged to stop in the path of the mainline traffic. 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 board at its starting point should be located sufficiently in advance so that the arrow board 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 speeds located in advance of the entrance terminal should be placed in pairs (one on each side of the ramp).

*Option:*

7. A Stop Beacon (see Section 4L.05) or a Type B high-intensity warning flasher with a red lens may be placed above the STOP sign.

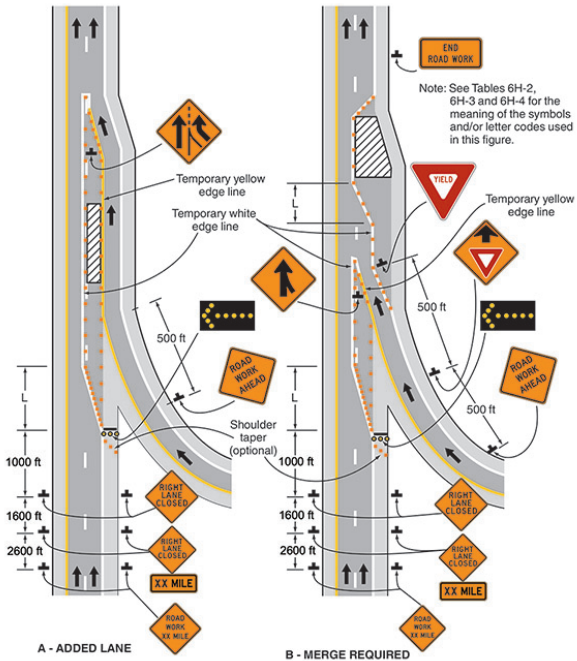
8. Where the acceleration distance is significantly reduced, a supplemental plaque may be placed below the Yield Ahead sign reading NO MERGE AREA.

8A. For Short-Term applications, when post mounted signs are not used, the distance legend may be shown on the sign face rather than on a supplemental plaque.

**Standard:**

9. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.

Figure 6H-44. Work in the Vicinity of an Entrance Ramp (TA-44)



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 (see Section 6F.85) 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 downstream end of the movable barrier for southbound traffic as shown in the typical application on the left. During Phase B, the transfer vehicle should be parked behind between the downstream ends of the movable barriers at the north end of the TTC zone as shown in the typical application on the right.*

*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 2 LEFT LANES CLOSED AHEAD. Change the mode of the second northbound arrow board 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 2 LEFT LANES CLOSED AHEAD to a LEFT LANE CLOSED AHEAD. Change the mode of the second southbound arrow board 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.*
- 3A. *The 1/2L MIN. shifting taper length should be calculated using the full width of the offset for the shift.*

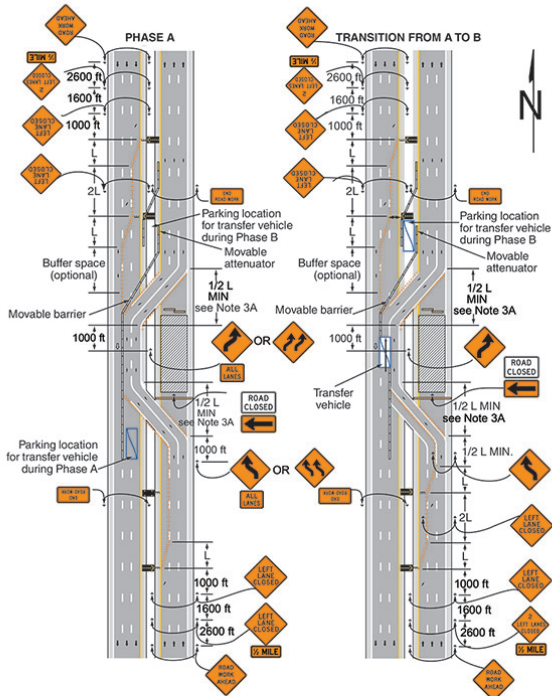
**Option:**

4. 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.
5. A longitudinal buffer space may be used in the activity area to separate opposing vehicular traffic.
6. A work vehicle or a shadow vehicle may be equipped with a truck-mounted attenuator.

**Standard:**

7. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**

Figure 6H-45. Temporary Reversible Lane Using Movable Barriers (TA-45)



Typical Application 45

Note: See Tables 6H-2, 6H-3 and 6H-4 for the meaning of the symbols and/or letter codes used in this figure. Although leader lines point to the signs on the right-hand side of the roadway, most of these signs should be installed on both sides of the roadway.

**Notes for Figure 6H-46—Typical Application 46****Work in the Vicinity of a Grade Crossing***Guidance:*

1. *When 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, by lane restrictions, flagging, or other operations, where vehicles might be stopped within the grade crossing, considered as being 15 feet 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 grade crossing to prevent vehicles from stopping within the grade crossing (as described in Note 1), even if automatic warning devices are in place.**

*Guidance:*

3. *Early coordination with the railroad company or light rail transit agency should occur before work starts.*
4. *In the example depicted, the buffer space of the activity area should be extended upstream of the grade crossing (as shown) so that a queue created by the flagging operation will not extend across the grade crossing.*
5. *The DO NOT STOP ON TRACKS sign should be used on all approaches to a 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.

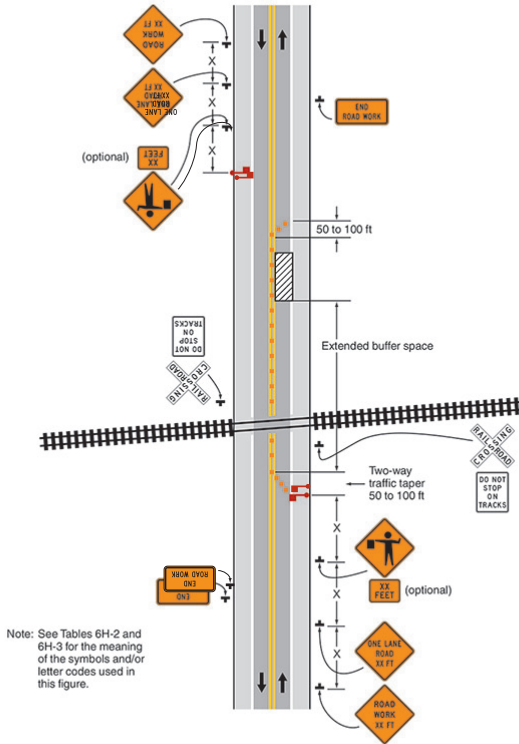
*Guidance:*

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 the Vicinity of a Grade Crossing (TA-46)



Support: 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 inform road users and to provide guidance information on the path to follow...

Guidance:

Emergency vehicles should be safe-positioned...such that traffic flow through the incident scene is optimized.

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



Support: The use of emergency-vehicle lighting...is essential... Emergency-vehicle lighting however provides warning only and provides no effective traffic control.

Guidance: Public safety agencies should examine their policies on the use of emergency-vehicle lighting,...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 oncoming road users.

***Reference Guide to the  
2011 Texas Manual on Uniform Traffic Control Devices***

*Printed May 2014*

