CHAPTER 6H. TYPICAL APPLICATIONS

Section 6H.01 Typical Applications

Support:

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

Standard:

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

Support:

Chapter 6G contains discussions of typical TTC activities. Chapter 6H presents typical applications for a variety of situations commonly encountered. While not every situation is addressed, the information illustrated can generally be adapted to a broad range of conditions. In many instances, an appropriate TTC plan is achieved by combining features from various typical applications. For example, work at an intersection might present a near-side work zone for one street and a far-side work zone for the other street. These treatments are found in two different typical applications, while a third typical application shows how to handle pedestrian crosswalk closures. For convenience in using the typical application diagrams, Tables 6C-1 and 6C-4 are reproduced in this Chapter as Tables 6H-3 and 6H-4, respectively.

Procedures for establishing TTC zones vary with such conditions as road configuration, location of the work, work activity, duration of work, road user volumes, road vehicle mix (buses, trucks, cars, motorcycles, and bicycles), and road user speeds. Examples are presented in this Chapter showing how to apply principles and standards. Applying these guidelines to actual situations and adjusting to field conditions requires judgment. In general, the procedures illustrated represent minimum solutions for the situations depicted.

Option:

Other devices may be added to supplement the devices and device spacing may be adjusted to provide additional reaction time or delineation. Fewer devices may be used based on field conditions.

Support:

Figures and tables found throughout Part 6 provide information for the development of TTC plans. Also, Table 6H-3 is used for the determination of sign spacing and other dimensions for various area and roadway types.

Table 6H-1 is an index of the 46 typical applications. Typical applications are shown on the right page with notes on the facing page to the left. The legend for the symbols used in the typical applications is provided in Table 6H-2. In many of the typical applications, sign spacings and other dimensions are indicated by letters using the criteria provided in Table 6H-3. The formulas for determining taper lengths are provided in Table 6H-4.

Most of the typical applications show TTC devices for only one direction.

Support:

Typical applications for a variety of work zone situations commonly encountered are illustrated in the Maryland Book of Standards, Section 100. The Work Zone Traffic Control Typicals can be obtained from the SHA's Office of Traffic & Safety, Traffic Development & Support Division (TDSD) at the address shown on Page i.

Support:

The "Guidelines for Work Zone on 65/60 mph Roadways" contains further information regarding mandatory reduction of speed limits in work zones along 120 km/h (65 mph) and 110 km/h (60 mph) roadways. This document can be obtained from the SHA's Office of Traffic & Safety, Traffic Development & Support Division (TDSD) at the address shown on Page i.

Support:

The "Temporary Traffic Control Guidelines for Installation/Removal of Temporary Traffic Counters" used in combination with the Maryland Book of Standards and State Highway Administration's Standard Specification for Construction and Materials contains further information regarding temporary traffic counter installation/removal. This document can be obtained from the SHA's Office of Traffic & Safety, Traffic Development & Support Division (TDSD) at the address shown on Page i.

*Table 6H-1. Index to Typical Applications (Sheet 1 of 2)**

Typical Application Description	Typical Application Number
Work Outside of Shoulder (see Section 6G.06)	
Work Beyond the Shoulder	TA-1
Blasting Zone	TA-2
Work on the Shoulder (see Sections 6G.07 and 6G.08)	
Work on Shoulders	TA-3
Short Duration or Mobile Operation on Shoulder	TA-4
Shoulder Closure on Freeway	TA-5
Shoulder Work with Minor Encroachment	TA-6
Work Within the Traveled Way of Two-Lane Highways (see Section 6G.10)	
Road Closed with Diversion	TA-7
Roads Closed with Off-Site Detour	TA-8
Overlapping Routes with Detour	TA-9
Lane Closure on Two-Lane Road Using Flaggers	TA-10
Lane Closure on Two-Lane Road with Low Traffic Volumes	TA-11
Lane Closure on Two-Lane Road Using Traffic Control Signals	TA-12
Temporary Road Closure	TA-13
Haul Road Crossing	TA-14
Work in Center of Road with Low Traffic Volumes	TA-15
Surveying Along Centerline of Road with Low Traffic Volumes	TA-16
Mobile Operations on Two-Lane Road	TA-17
Work Within the Traveled Way of Urban Streets (see Section 6G.11)	
Lane Closure on Minor Street	TA-18
Detour for One Travel Direction	TA-19
Detour for Closed Street	TA-20
Work Within the Traveled Way at an Intersection and Sidewalks (see Section 6G.13)	
Lane Closure on Near Side of Intersection	TA-21
Right Lane Closure on Far Side of Intersection	TA-22
Left Lane Closure on Far Side of Intersection	TA-23
Half Road Closure on Far Side of Intersection	TA-24
Multiple Lane Closures at Intersection	TA-25
Closure in Center of Intersection	TA-26
Closure at Side of Intersection	TA-27
Sidewalk Closures and Bypass Sidewalks	TA-28
Crosswalk Closures and Pedestrian Detours	TA-29

* Along State owned, operated, and maintained roadways, use the TTC Typical Applications found in the Maryland Book of Standards, Section 100. This reference can be obtained form the SHA's Office of Traffic Safety, Traffic Development and Support Division (TDSD), at the address shown on Page i.

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*Table 6H-1. Index to Typical Applications (Sheet 2 of 2)**

Typical Application Description	Typical Application Number
Work Within the Traveled Way of Multi-lane, Nonaccess Controlled Highways (see Section 6G.12)	
Interior Lane Closure on Multi-lane Street	TA-30
Lane Closure on Street with Uneven Directional Volumes	TA-31
Half Road Closure on Multi-lane, High-Speed Highway	TA-32
Lane Closure on Divided Highway	TA-33
Lane Closure with Temporary Traffic Barrier	TA-34
Mobile Operation on Multi-lane Road	TA-35
Work Within the Traveled Way of Expressways and Freeways (see Section 6G.14)	
Lane Shift on Freeway	TA-36
Double Lane Closure on Freeway	TA-37
Interior Lane Closure on Freeway	TA-38
Median Crossover on Freeway	TA-39
Median Crossover for Entrance Ramp	TA-40
Median Crossover for Exit Ramp	TA-41
Work in Vicinity of Exit Ramp	TA-42
Partial Exit Ramp Closure	TA-43
Work in Vicinity of Entrance Ramp	TA-44
Temporary Reversible Lane Using Movable Barriers	TA-45
Work in the Vicinity of Highway-Rail Grade Crossings (see Section 6G.19)	
Work in Vicinity of Highway-Rail Grade Crossing	TA-46

* Along State owned, operated, and maintained roadways, use the TTC Typical Applications found in the Maryland Book of Standards, Section 100. This reference can be obtained form the SHA's Office of Traffic Safety, Traffic Development and Support Division (TDSD), at the address shown on Page i.

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

	Arrow panel
	Arrow panel support or trailer (shown facing down)
	Changeable message sign or support trailer
	Channelizing device
	Crash Cushion
	Direction of temporary traffic detour
	Direction of traffic
	Flagger
*	High level warning device (Flag tree)
	Luminaire
	Pavement markings that should be removed for a long term project
	Sign (shown facing left)
	Surveyor
	Temporary barrier
	Temporary barrier with warning lights
	Traffic or Pedestrian signal
	Truck mounted attenuator
	Type III Barricade
	Warning lights
	Work space
	Work vehicle

* Shall not be used along State owned, operated, or maintained roadways. SHA 07/09

Table 6H-3. Meaning of Letter Codes on Typical Application Diagrams

	Road Type	Distance Between Signs**		
		A	B	C
***	Urban (low speed)*	30 (100)	30 (100)	30 (100)
***	Urban (high speed)*	100 (350)	100 (350)	100 (350)
	Rural	150 (500)	150 (500)	150 (500)
	Expressway / Freeway	300 (1,000)	450 (1,500)	800 (2,640)

* Speed category to be determined by highway agency

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

*** **Along State owned, operated, and maintained roadways, urban low speed shall be defined as less than or equal to 40 mph and urban high speed shall be defined as greater than 40 mph.** SHA 07/09

Table 6H-4. Formulas for Determining Taper Lengths

Speed Limit (S)	Taper Length (L) Meters
60 km/h or less	$L = \frac{WS^2}{155}$
70 km/h or more	$L = \frac{WS}{1.6}$

Speed Limit (S)	Taper Length (L) Feet
40 mph or less	$L = \frac{WS^2}{60}$
45 mph or more	$L = WS$

Where: L = taper length in meters (feet)

W = width of offset in meters (feet)

S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in km/h (mph)

Notes for Figure 6H-1—Typical Application 1
Work Beyond the Shoulder

Guidance:

1. If the work space is in the median of a divided highway, an advance warning sign should also be placed on the left side of the directional roadway.

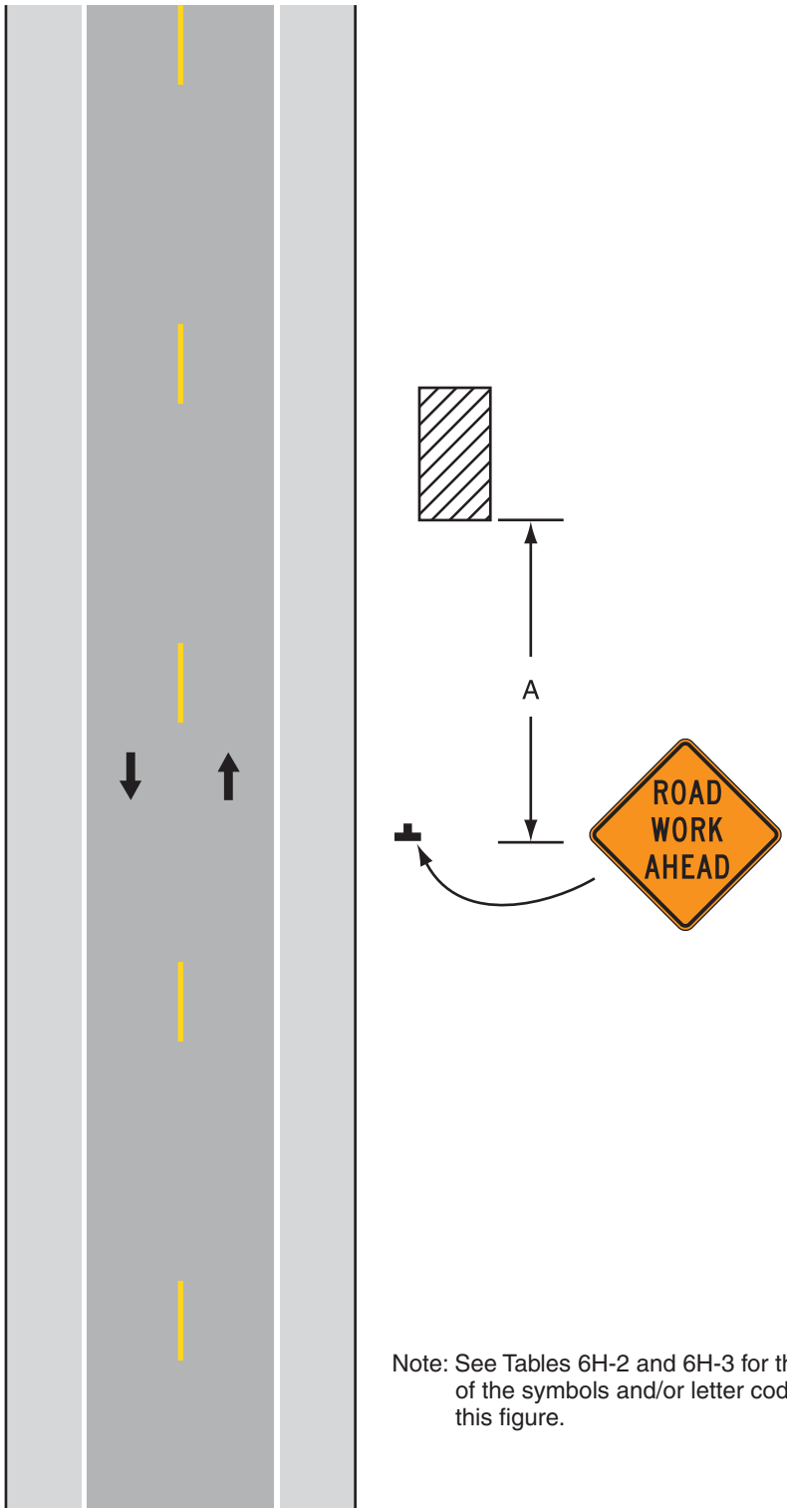
Option:

2. The ROAD WORK AHEAD sign may be replaced with other appropriate signs such as the SHOULDER WORK sign. The SHOULDER WORK sign may be used for work adjacent to the shoulder.
3. The ROAD WORK AHEAD sign may be omitted where the work space is behind a barrier, more than 600 mm (24 in) behind the curb, or 4.6 m (15 ft) or more from the edge of any roadway.
4. For short-term, short-duration or mobile operation, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

6. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Figure 6H-1. Work Beyond the Shoulder (TA-1)



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

Typical Application 1

Notes for Figure 6H-2—Typical Application 2
Blasting Zone

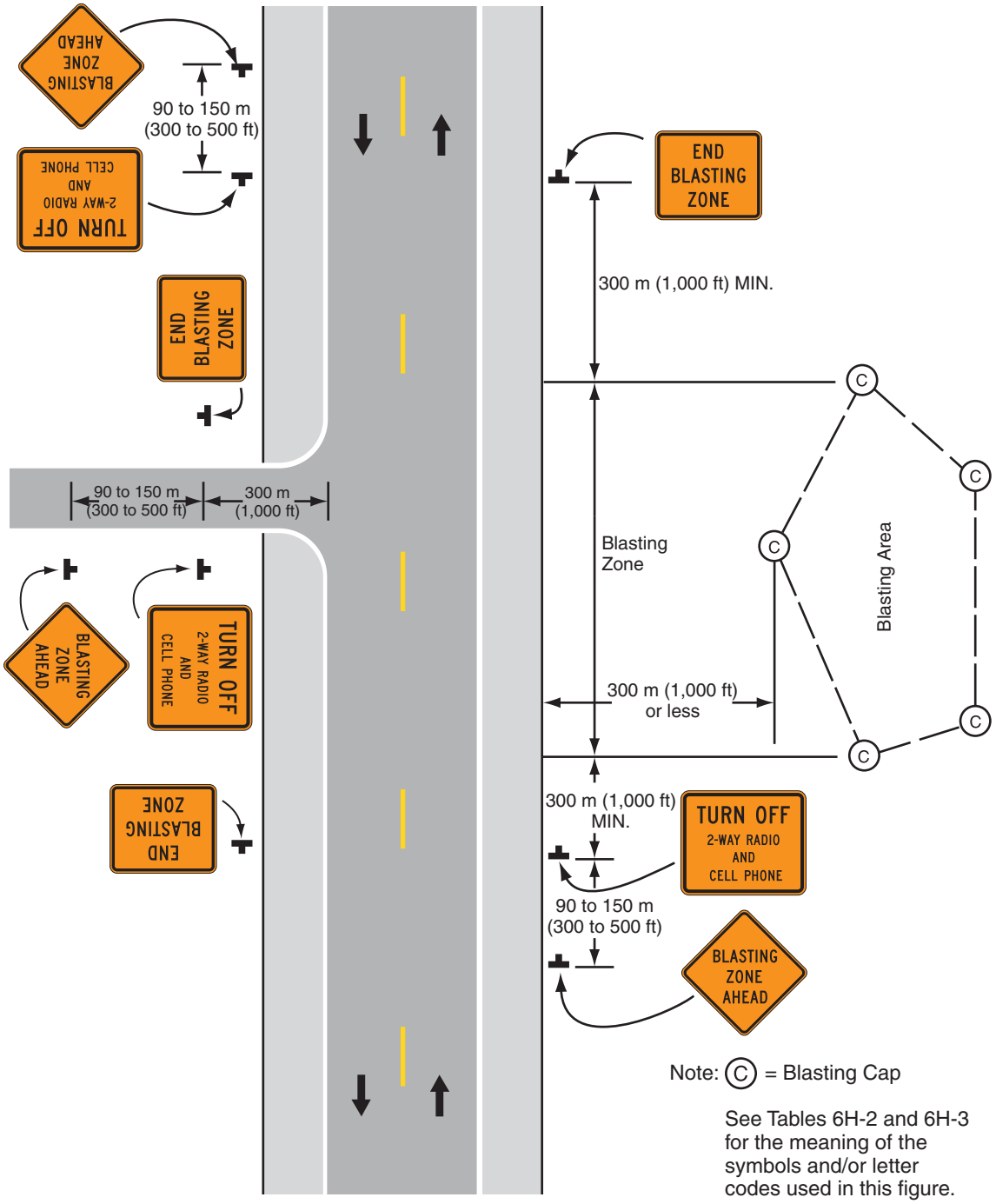
Standard:

1. **Whenever blasting caps are used within 300 m (1,000 ft) of a roadway, the signing shown shall be used.**
2. **The signs shall be covered or removed when there are no explosives in the area or the area is otherwise secure.**
3. **Whenever a side road intersects the roadway between the BLASTING ZONE AHEAD sign and the END BLASTING ZONE sign, or a side road is within 300 m (1,000 ft) of any blasting cap, similar signing, as on the mainline, shall be installed on the side road.**
4. **Prior to blasting, the blaster in charge shall determine whether road users in the blasting zone will be endangered by the blasting operation. If there is danger, road users shall not be permitted to pass through the blasting zone during blasting operations.**

Guidance:

5. On a divided highway, the signs should be mounted on both sides of the directional roadways.

Figure 6H-2. Blasting Zone (TA-2)



Typical Application 2

Notes for Figure 6H-3—Typical Application 3
Work on Shoulders

Guidance:

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

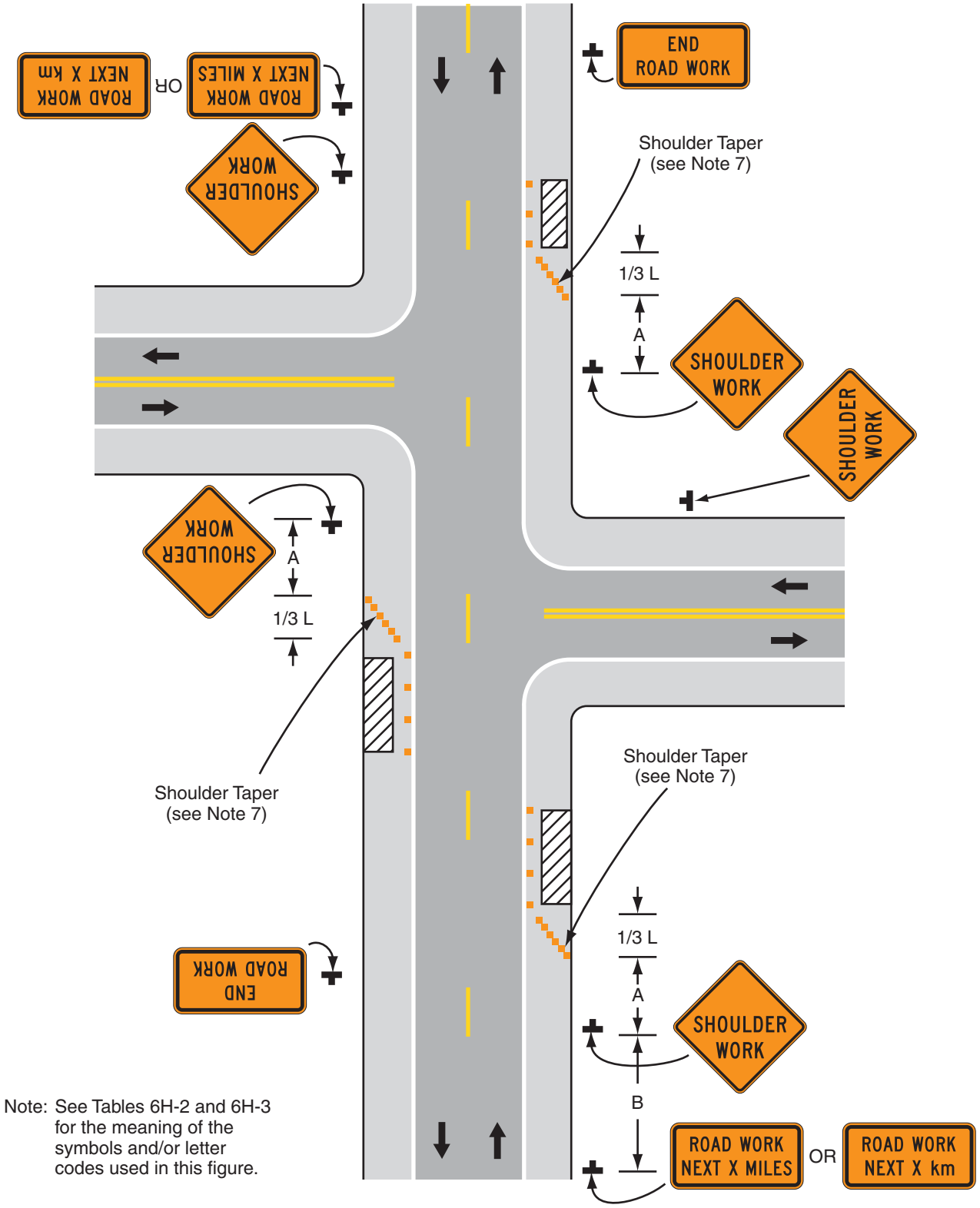
Option:

2. The Workers symbol signs may be used instead of SHOULDER WORK signs.
3. The SHOULDER WORK AHEAD sign on an intersecting roadway may be omitted where drivers emerging from that roadway will encounter another advance warning sign prior to this activity area.
4. For short-duration operations of 60 minutes or less, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

6. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
7. **When paved shoulders having a width of 2.4 m (8 ft) or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.**

Figure 6H-3. Work on Shoulders (TA-3)



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

Typical Application 3

Notes for Figure 6H-4—Typical Application 4
Short-Duration or Mobile Operation on Shoulder

Guidance:

1. In those situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 8 km (5 mi).
2. In those situations where the distance between the advance signs and the work is 3.2 km (2 mi) to 8 km (5 mi), a Supplemental Distance plaque should be used with the ROAD WORK AHEAD sign.

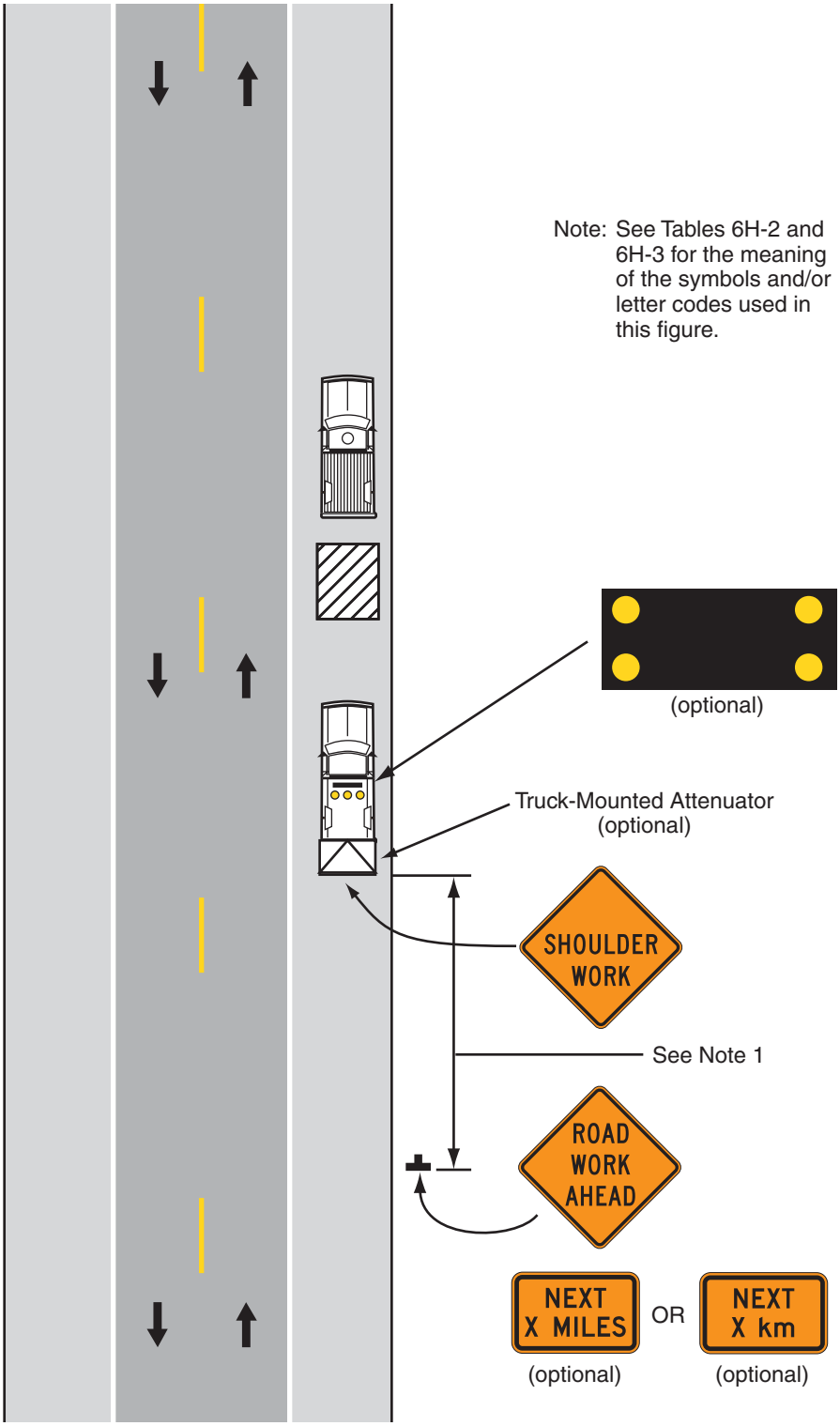
Option:

3. The ROAD WORK NEXT XX km (MILES) sign may be used instead of the ROAD WORK AHEAD sign if the work locations occur over a distance of more than 3.2 km (2 mi).
4. Warning signs may be omitted when the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights if the distance between work locations is 1.6 km (1 mile) or more, and if the work vehicle travels at vehicular traffic speeds between locations.
5. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

6. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
7. **If an arrow panel is used for an operation on the shoulder, the caution mode shall be used.**

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



Typical Application 4

Notes for Figure 6H-5—Typical Application 5
Shoulder Closure on Freeway

Guidance:

1. SHOULDER CLOSED signs should be used on limited-access highways where there is no opportunity for disabled vehicles to pull off the roadway.
2. If drivers cannot see a pull-off area beyond the closed shoulder, information regarding the length of the shoulder closure should be provided in meters or kilometers (feet or miles), as appropriate.
3. The use of a temporary traffic barrier should be based on engineering judgment.

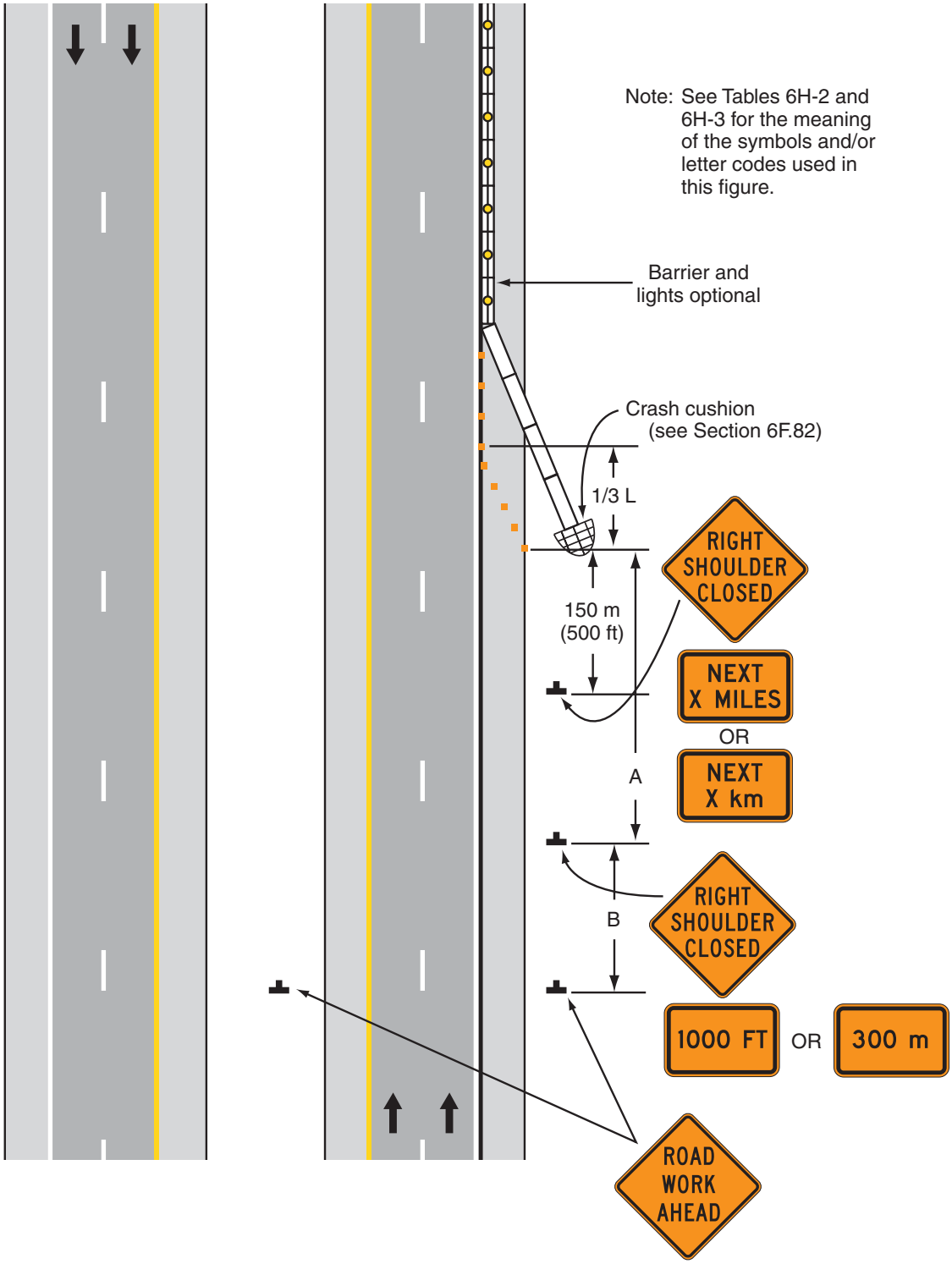
Standard:

4. **Where temporary traffic barriers are installed, the ends of the barrier shall be treated in accordance with the provisions of Section 6F.81.**

Option:

5. The barrier shown in this typical application is an example of one method that may be used to close a shoulder of a long-term project.
6. The warning lights shown on the barrier may be used.

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



Typical Application 5

Notes for Figure 6H-6—Typical Application 6
Shoulder Work with Minor Encroachment

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.
2. The treatment shown should be used on a minor road having low speeds. For higher-speed traffic conditions, a lane closure should be used.

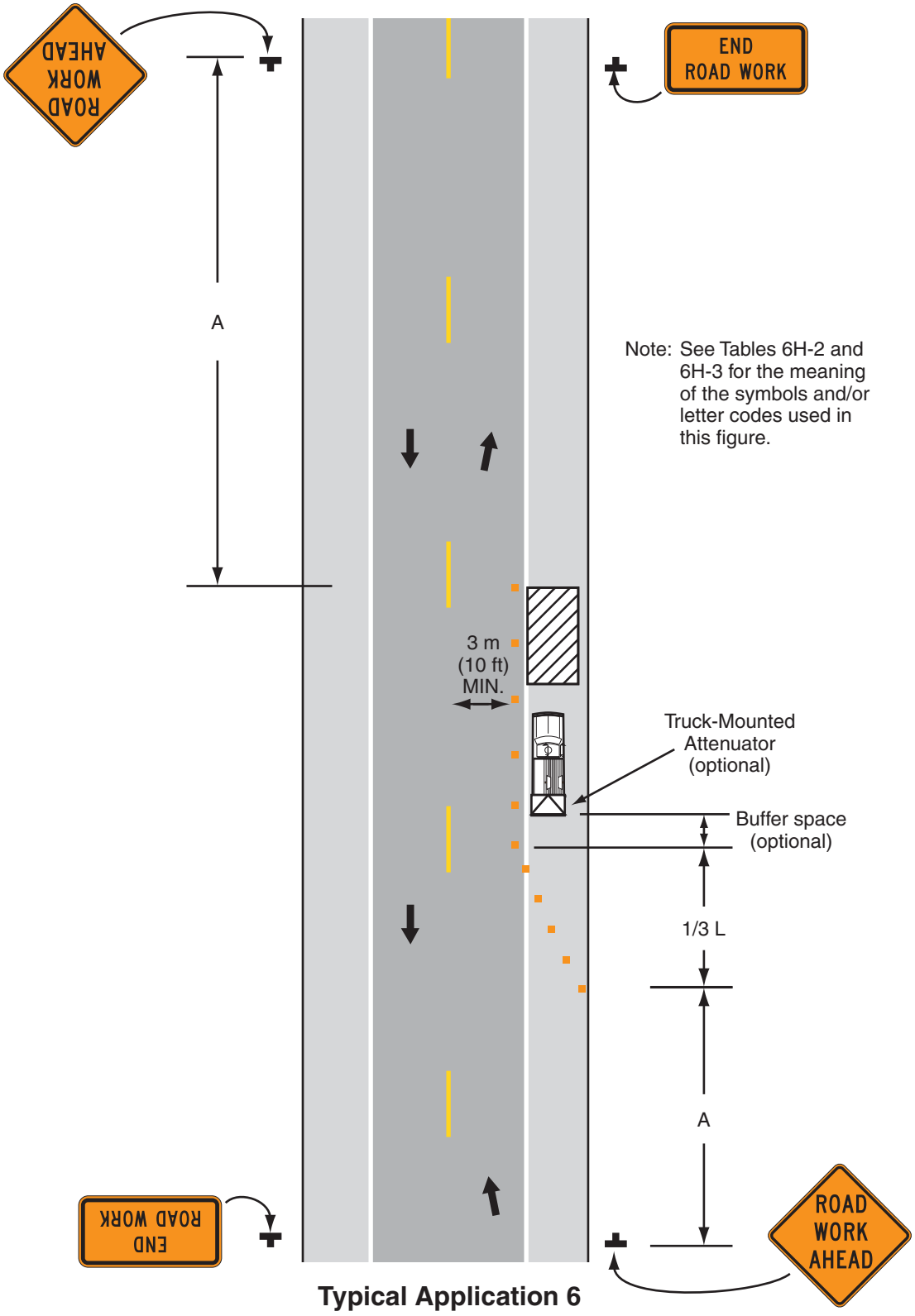
Option:

3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.
4. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely spaced channelizing devices, provided that the minimum lane width of 3 m (10 ft) is maintained.
5. Additional advance warning may be appropriate, such as a ROAD NARROWS sign.
6. Temporary traffic barriers may be used along the work space.
7. The shadow vehicle may be omitted if a taper and channelizing devices are used.
8. A truck-mounted attenuator may be used on the shadow vehicle.
9. For short-duration work, the taper and channelizing devices may be omitted if a shadow vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.
10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

11. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

Figure 6H-6. Shoulder Work with Minor Encroachment (TA-6)



Typical Application 6

Notes for Figure 6H-7—Typical Application 7
Road Closure with Diversion

Support:

1. Signs and object markers are shown for one direction of travel only.

Standard:

2. **Devices similar to those depicted shall be placed for the opposite direction of travel.**
3. **Pavement markings no longer applicable shall be removed or obliterated as soon as practicable.**
4. **Temporary barriers and end treatments shall be crashworthy.**

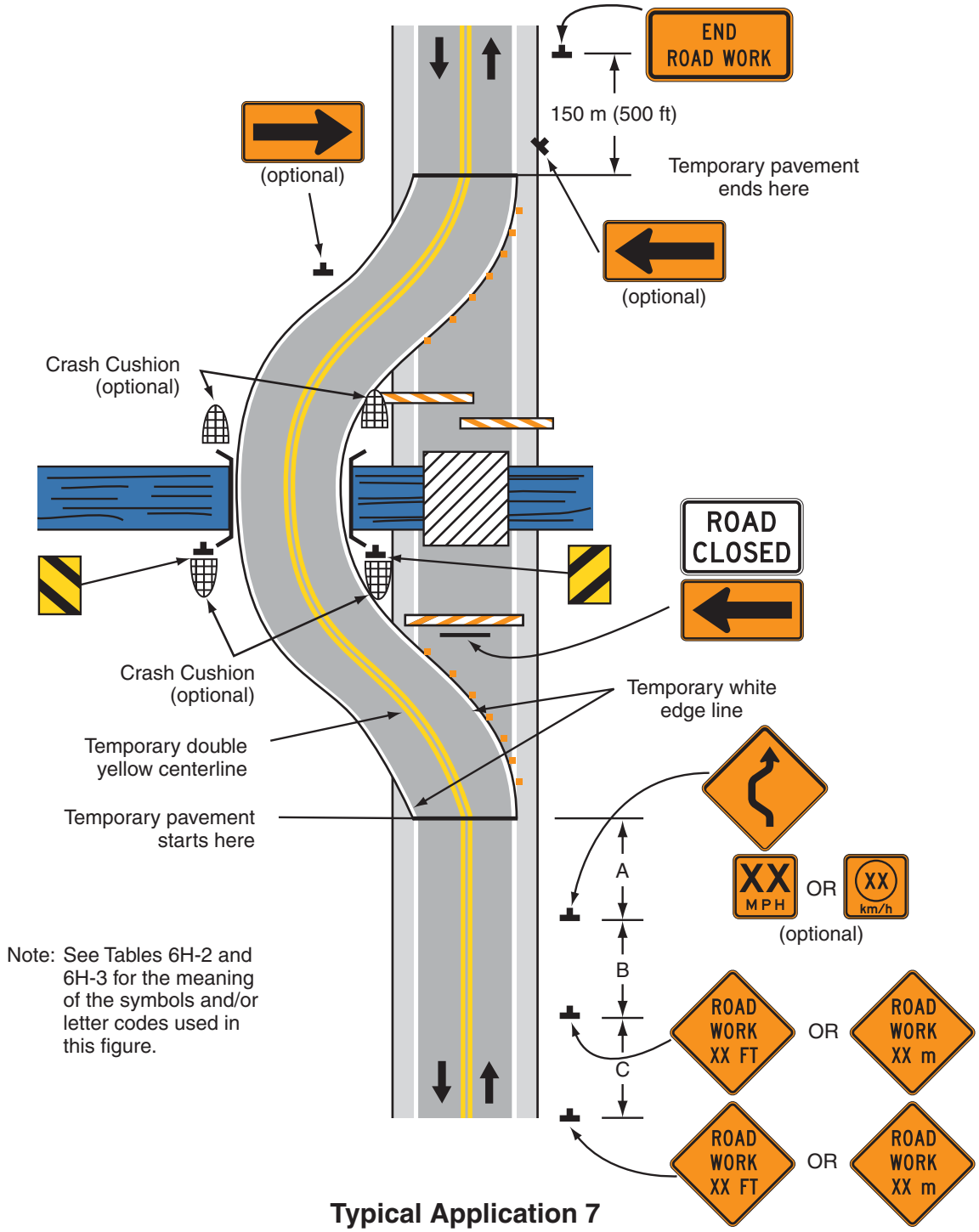
Guidance:

5. If the tangent distance along the temporary diversion is more than 180 m (600 ft), a Reverse Curve sign, left first, should be used instead of the Double Reverse Curve sign, and a second Reverse Curve sign, right first, should be placed in advance of the second reverse curve back to the original alignment.
6. When the tangent section of the diversion is more than 180 m (600 ft), and the diversion has sharp curves with recommended speeds of 50 km/h (30 mph) or less, Reverse Turn signs should be used.
7. Where the temporary pavement and old pavement are different colors, the temporary pavement should start on the tangent of the existing pavement and end on the tangent of the existing pavement.

Option:

8. Flashing warning lights and/or flags may be used to call attention to the warning signs.
9. On sharp curves, large arrow signs may be used in addition to other advance warning signs.
10. Delineators or channelizing devices may be used along the diversion.

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



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

Typical Application 7

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

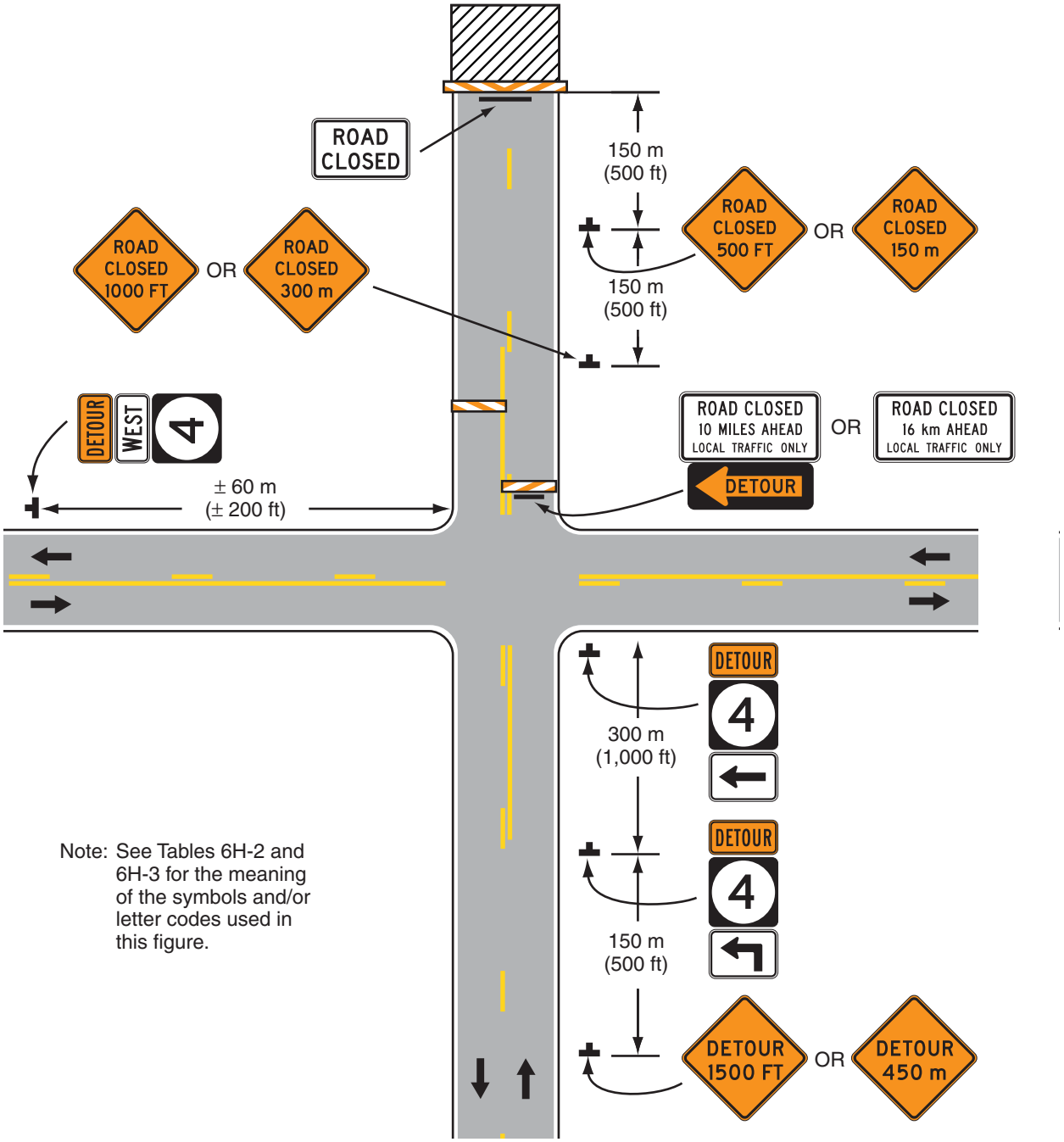
Guidance:

1. Regulatory traffic control devices should be modified as needed for the duration of the detour.

Option:

2. If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection, the ROAD CLOSED and DETOUR signs on Type III Barricades may be located at the edge of the traveled way.
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 Off-Site Detour (TA-8)



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

Typical Application 8

Notes for Figure 6H-9—Typical Application 9
Overlapping Routes with Detour

Support:

1. TTC devices are shown for one direction of travel only.

Standard:

2. Devices similar to those depicted shall be placed for the opposite direction of travel.

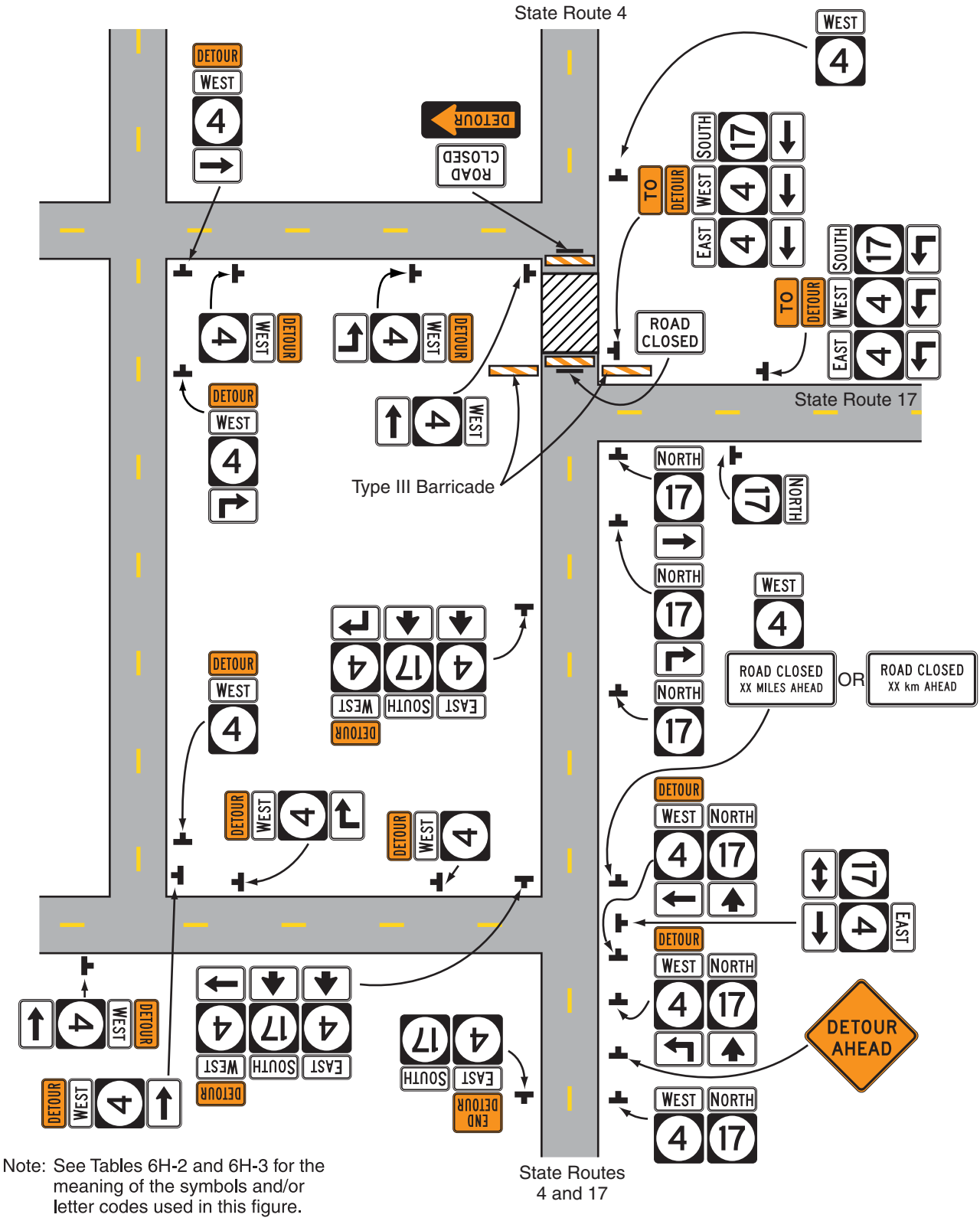
Guidance:

3. STOP signs displayed to side roads should be installed as needed along the temporary route.

Option:

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

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



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

Typical Application 9

Notes for Figure 6H-10—Typical Application 10
Lane Closure on Two-Lane Road Using Flaggers

Option:

1. For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used (see Chapter 6E).
2. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations.
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

4. The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.

Standard:

5. **At night, flagger stations shall be illuminated, except in emergencies.**

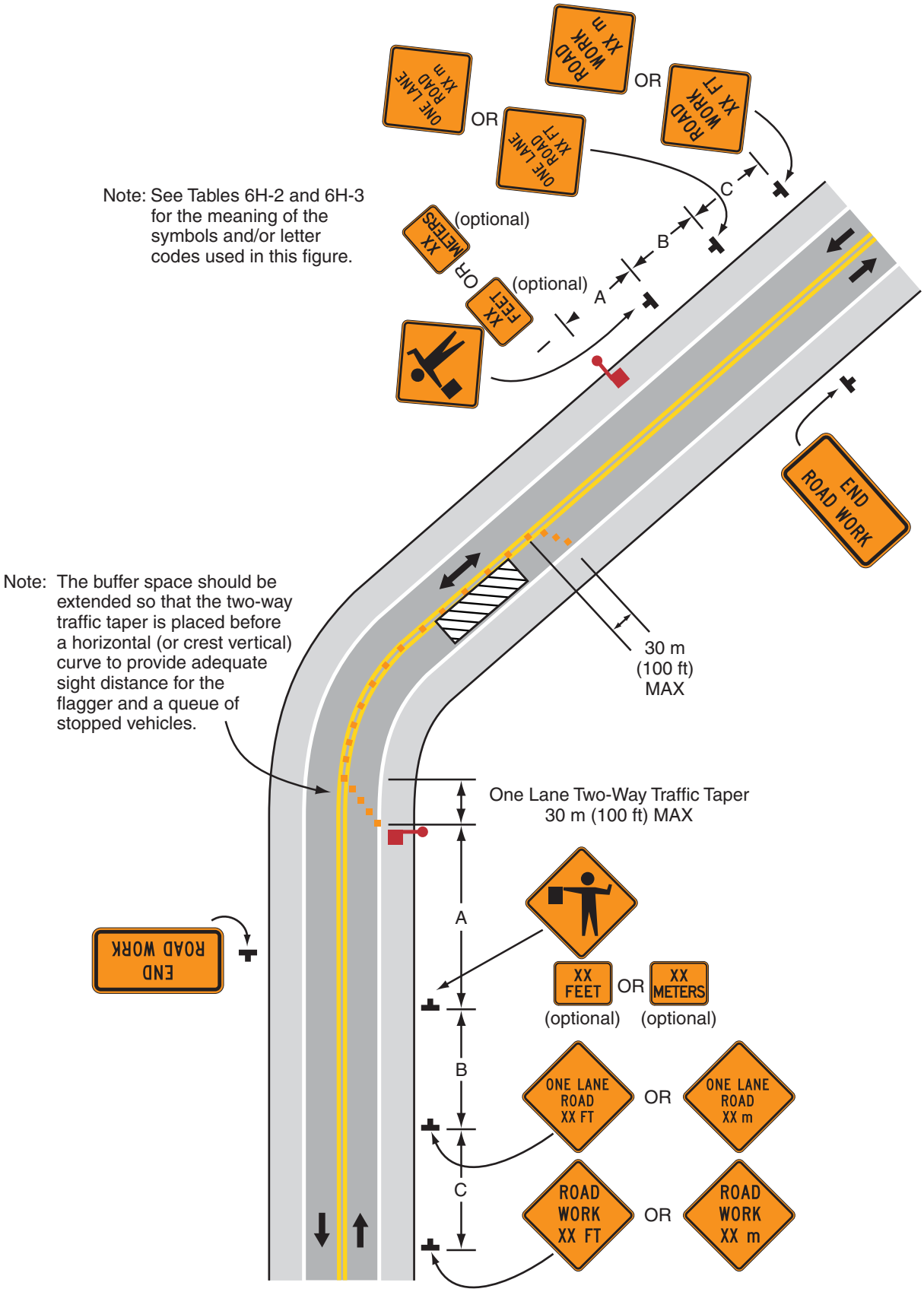
Guidance:

6. When used, the BE PREPARED TO STOP sign should be located between the Flagger sign and the ONE LANE ROAD sign.
7. When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the transition area precedes the highway-rail grade crossing.
8. When a highway-rail grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.
9. When a highway-rail grade crossing exists within the activity area, drivers operating on the left side of the normal centerline should be provided with comparable warning devices as for drivers operating on the right side of the normal centerline.
10. Early coordination with the railroad company should occur before work starts.

Option:

11. A flagger or a uniformed law enforcement officer may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.

Figure 6H-10. Lane Closure on Two-Lane Road Using Flaggers (TA-10)



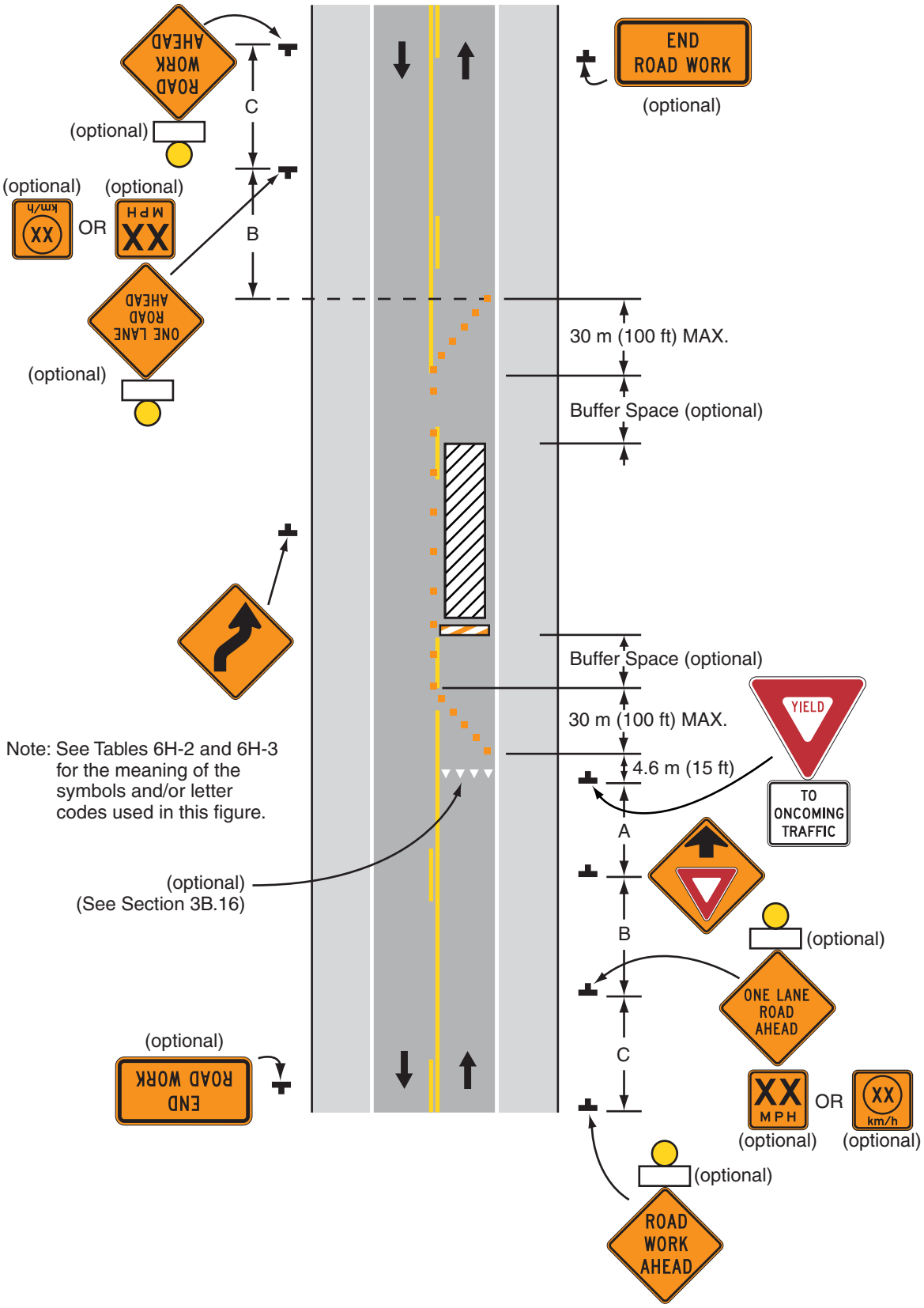
Typical Application 10

Notes for Figure 6H-11—Typical Application 11
Lane Closure on Two-Lane Road with Low Traffic Volumes

Option:

1. This TTC zone application may be used as an alternate to the TTC application shown in Figure 6H-10 (using flaggers) when the following conditions exist:
   a. Vehicular traffic volume is such that sufficient gaps exist for vehicular traffic that must yield.
   b. Road users from both directions are able to see approaching vehicular traffic through and beyond the work site and have sufficient visibility of approaching vehicles.
2. The Type B flashing warning lights may be placed on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs whenever a night lane closure is necessary.

Figure 6H-11. Lane Closure on Two-Lane Road with Low Traffic Volumes



Typical Application 11

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

Standard:

1. **TTC signals shall be installed and operated in accordance with the provisions of Part 4. TTC signals shall meet the physical display and operational requirements of conventional traffic control signals.**
2. **TTC signal timing shall be established by authorized officials. Durations of red clearance intervals shall be adequate to clear the one-lane section of conflicting vehicles.**
3. **When the TTC signal is changed to the flashing mode, either manually or automatically, red signal indications shall be flashed to both approaches.**
4. **Stop lines shall be installed with TTC signals for intermediate and long-term closures. Existing conflicting pavement markings and raised pavement marker reflectors between the activity area and the stop line shall be removed. After the TTC signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.**
5. **Safeguards shall be incorporated to avoid the possibility of conflicting signal indications at each end of the TTC zone.**

Guidance:

6. Where no-passing lines are not already in place, they should be added.
7. Adjustments in the location of the advance warning signs should be made as needed to accommodate the horizontal or vertical alignment of the roadway, recognizing that the distances shown for sign spacings are minimums. Adjustments in the height of the signal heads should be made as needed to conform to the vertical alignment.

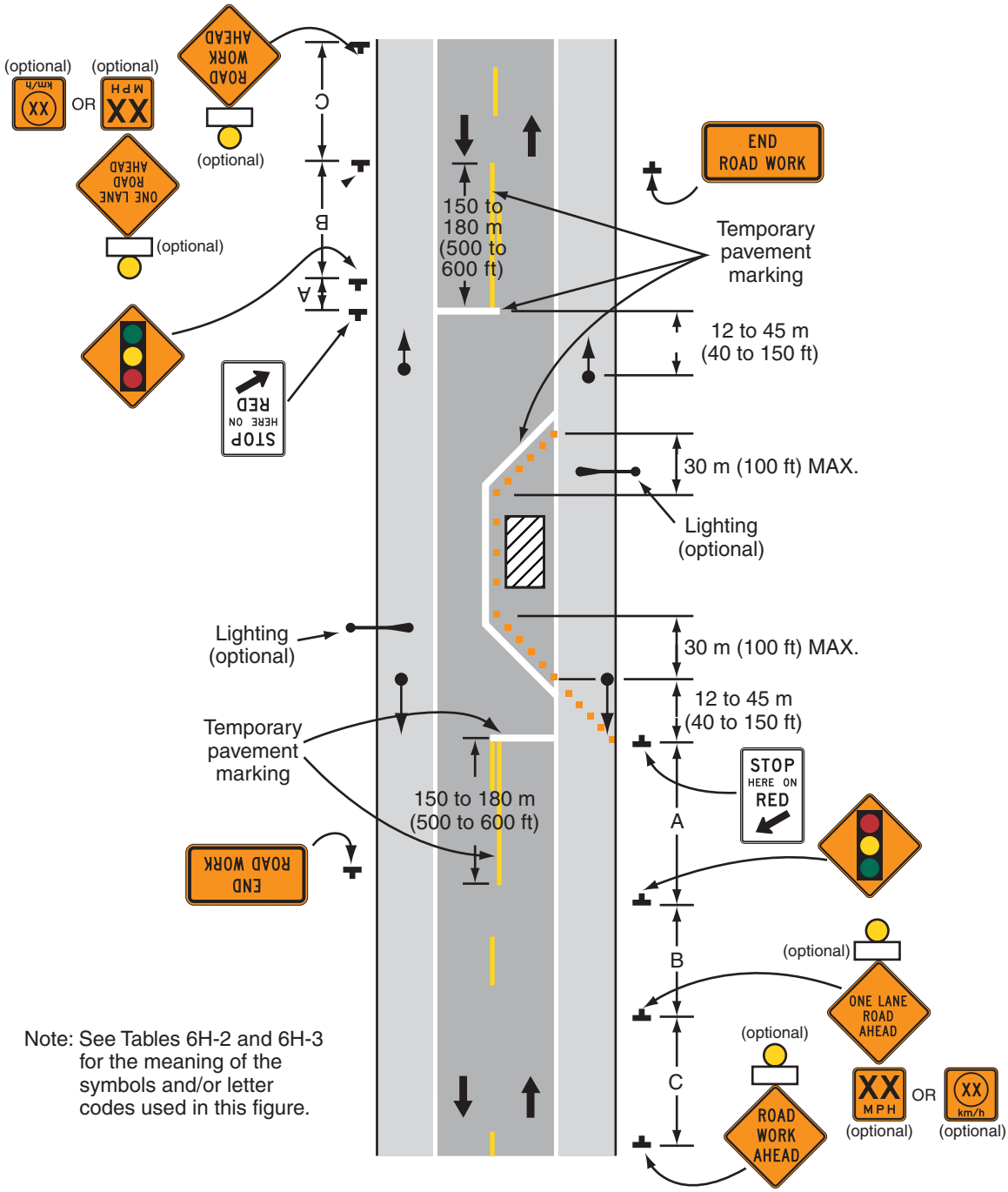
Option:

8. Flashing warning lights shown on the ROAD WORK AHEAD and the ONE LANE ROAD AHEAD signs may be used.
9. Removable pavement markings may be used.

Support:

10. TTC signals are preferable to flaggers for long-term projects and other activities that would require flagging at night.
11. The maximum length of activity area for one-way operation under TTC signal control is determined by the capacity required to handle the peak demand.

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



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

Typical Application 12

Notes for Figure 6H-13—Typical Application 13
Temporary Road Closure

Support:

1. Conditions represented are a planned closure not exceeding 20 minutes during the daytime.

Standard:

2. A flagger or uniformed law enforcement officer shall be used for this application. The flagger, if used for this application, shall follow the procedures noted in Sections 6E.04 and 6E.05.

Guidance:

3. The uniformed law enforcement officer, if used for this application, should follow the procedures noted in Sections 6E.04 and 6E.05.

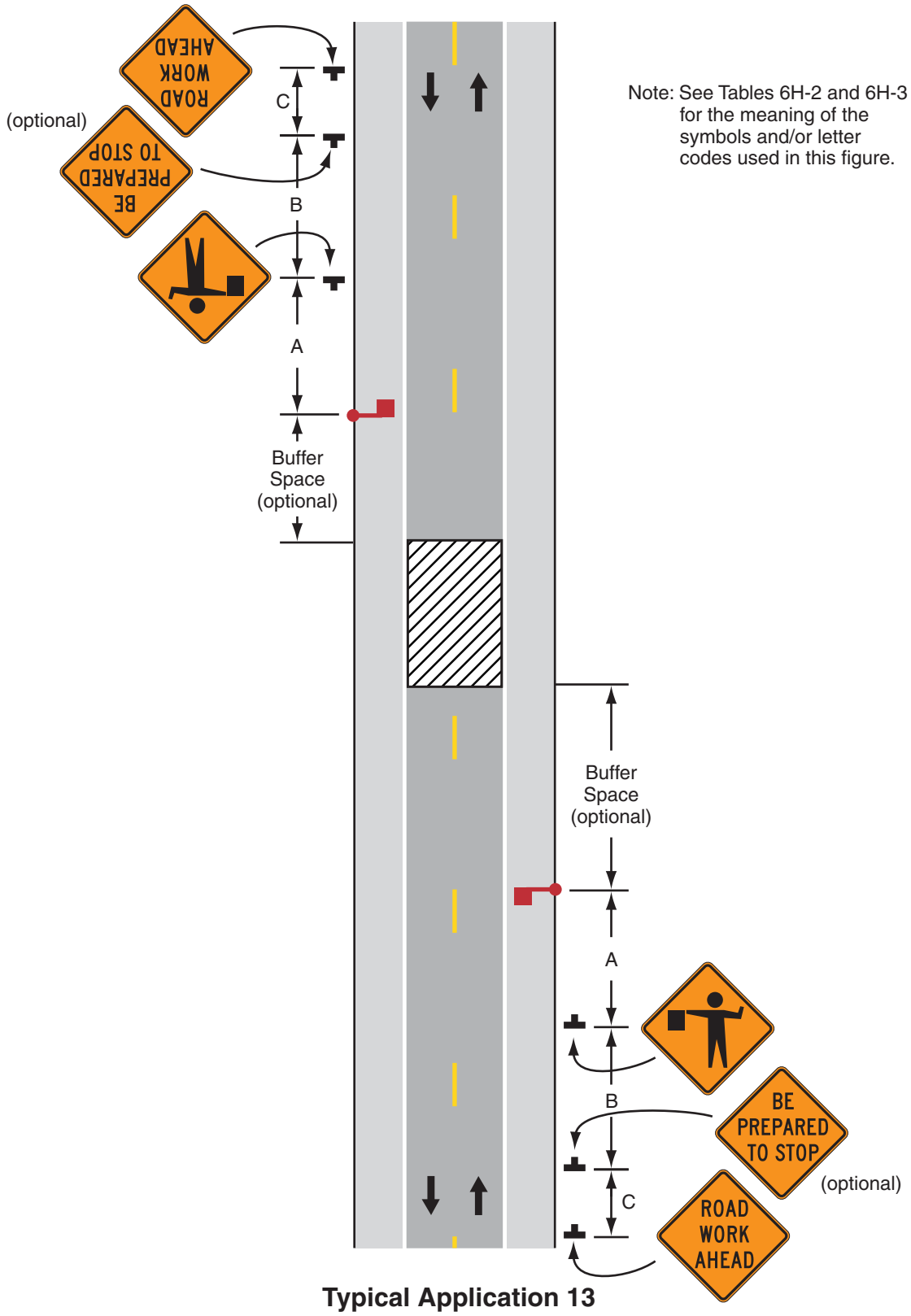
Option:

4. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

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

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



Typical Application 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.

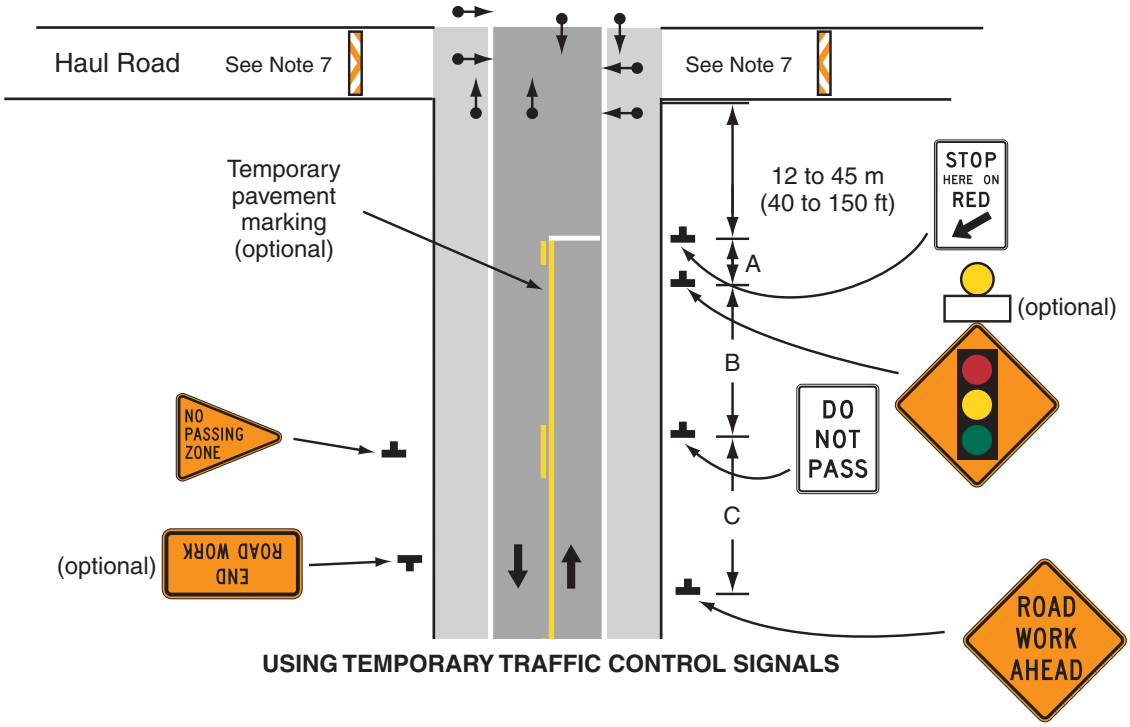
<u>Flagging Method</u>

4. When a road used exclusively as a haul road is not in use, the haul road shall be closed with Type III barricades and the Flagger symbol signs covered.
5. The flagger shall follow the procedures noted in Sections 6E.04 and 6E.05.
6. At night, flagger stations shall be illuminated, except in emergencies.

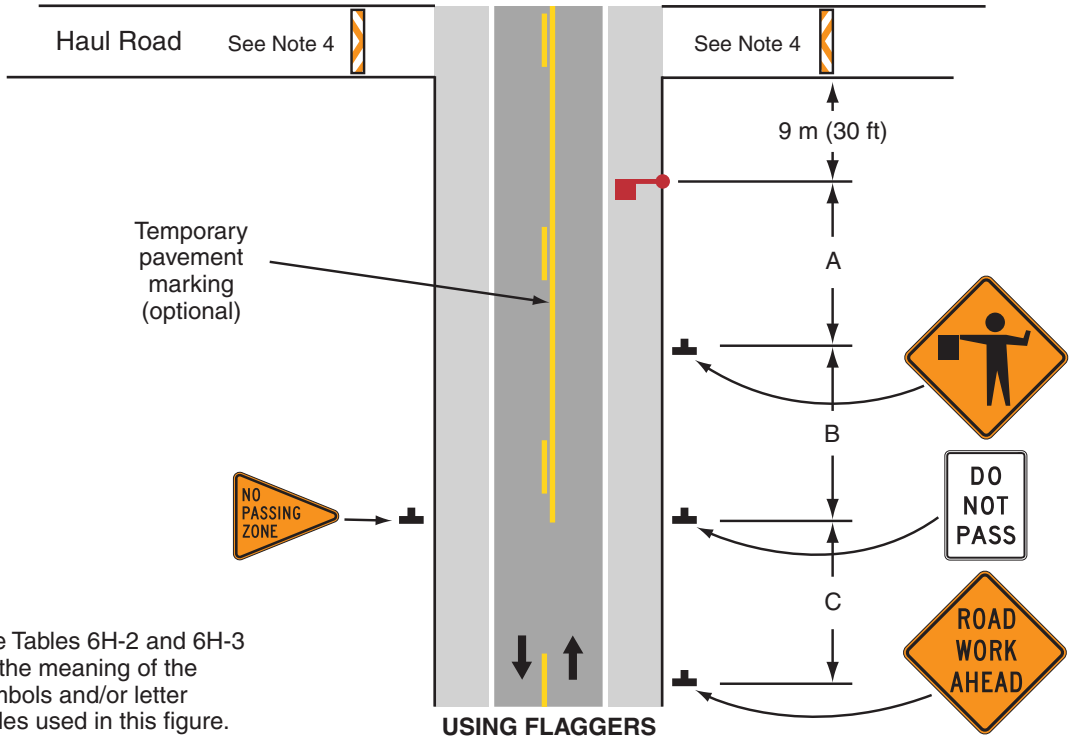
<u>Signalized Method</u>

7. When a road used exclusively as a haul road is not in use, Type III barricades shall be in place. The signals shall either flash yellow on the main road or be covered, and the Signal Ahead and STOP HERE ON RED signs shall be covered or hidden from view.
8. The TTC signals shall control both the highway and the haul road and shall meet the physical display and operational requirements of conventional traffic control signals as described in Part 4. Traffic control signal timing shall be established by authorized officials.
9. Stop lines shall be used on existing highway with TTC signals.
10. Existing conflicting pavements markings between the stop lines shall be removed. After the TTC signal is removed, the stop lines and other temporary pavement markings shall be removed and the permanent pavement markings restored.

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



USING TEMPORARY TRAFFIC CONTROL SIGNALS



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

USING FLAGGERS

Typical Application 14

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

Guidance:

1. The lanes on either side of the center work space should have a minimum width of 3 m (10 ft) as measured from the near edge of the channelizing devices to the edge of pavement or the outside edge of paved shoulder.
2. Workers in the roadway should wear high-visibility safety apparel as described in Section 6D.03.

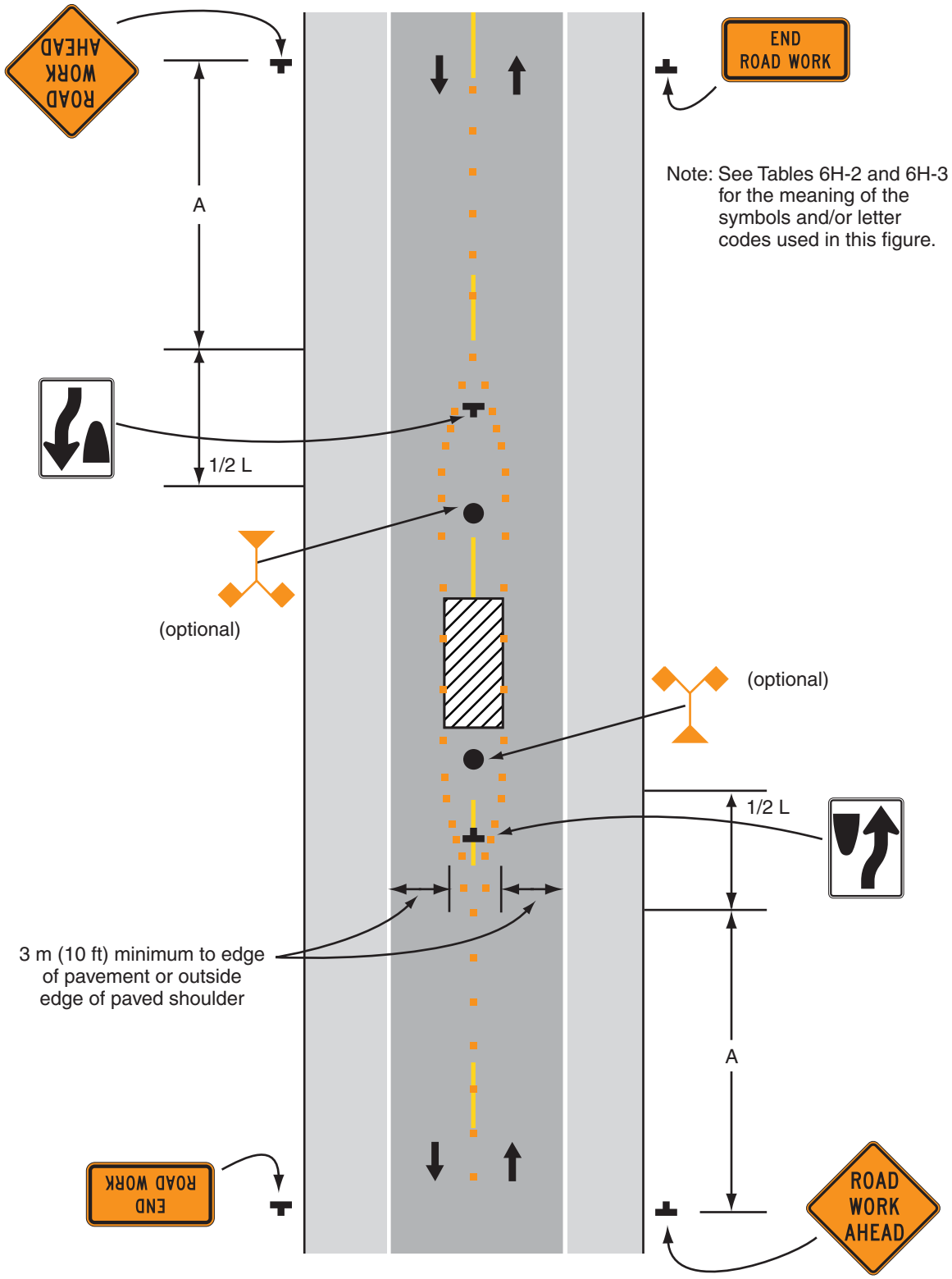
Option:

3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. If the closure continues overnight, warning lights may be used on the channelizing devices.
5. A lane width of 2.7 m (9 ft) may be used for short-term stationary work on low-volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.
6. A work vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights may be used instead of the channelizing devices forming the tapers or the high-level warning devices.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

8. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Figure 6H-15. Work in Center of Road with Low Traffic Volumes (TA-15)



Typical Application 15

Notes for Figure 6H-16—Typical Application 16
Surveying Along Centerline of Road with Low Traffic Volumes

Guidance:

1. Cones should be placed 150 mm (6 in) to 300 mm (12 in) on either side of the centerline.
2. When using metric units, spacing of channelizing devices should not exceed a distance in meters equal to 1/5 of the speed limit (km/h) when used for taper channelization and a distance in meters equal to 2/5 of the speed limit (km/h) when used for tangent channelization. When using English units, spacing of channelizing devices should not exceed a distance in feet equal to the speed limit (mph) when used for the taper channelization and a distance in feet of 2 times the speed limit (mph) when used for tangent channelization.
3. A flagger should be used to warn workers who cannot watch road users.
4. Workers in the roadway should wear high-visibility safety apparel as described in Section 6D.03.

Standard:

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

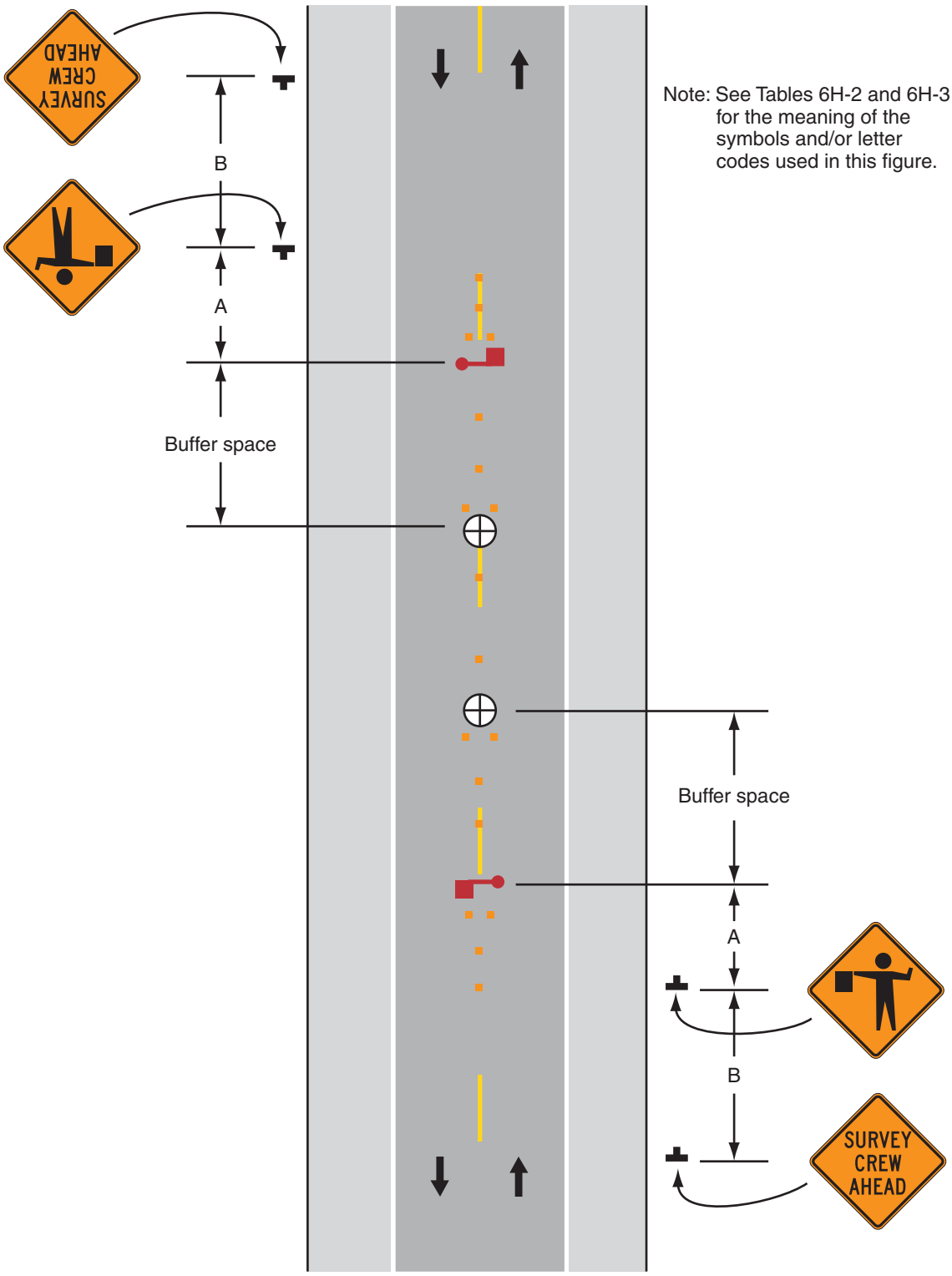
Option:

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

Guidance:

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

Figure 6H-16. Surveying Along Centerline of Road with Low Traffic Volumes (TA-16)



Typical Application 16

Notes for Figure 6H-17—Typical Application 17
Mobile Operations on Two-Lane Road

Standard:

1. **Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.**
2. **Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.**
3. **If an arrow panel is used, it shall be used in the caution mode.**

Guidance:

4. Where practical and when needed, the work and shadow vehicles should pull over periodically to allow vehicular traffic to pass.
5. Whenever adequate stopping sight distance exists to the rear, the shadow vehicle should maintain the minimum distance from the work vehicle and proceed at the same speed. The shadow vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance.
6. The shadow vehicles should also be equipped with two high-intensity flashing lights mounted on the rear, adjacent to the sign.

Option:

7. The distance between the work and shadow vehicles may vary according to terrain, paint drying time, and other factors.
8. Additional shadow vehicles to warn and reduce the speed of oncoming or opposing vehicular traffic may be used. Law enforcement vehicles may be used for this purpose.
9. A truck-mounted attenuator may be used on the shadow vehicle or on the work vehicle.
10. If the work and shadow vehicles cannot pull over to allow vehicular traffic to pass frequently, a DO NOT PASS sign may be placed on the rear of the vehicle blocking the lane.

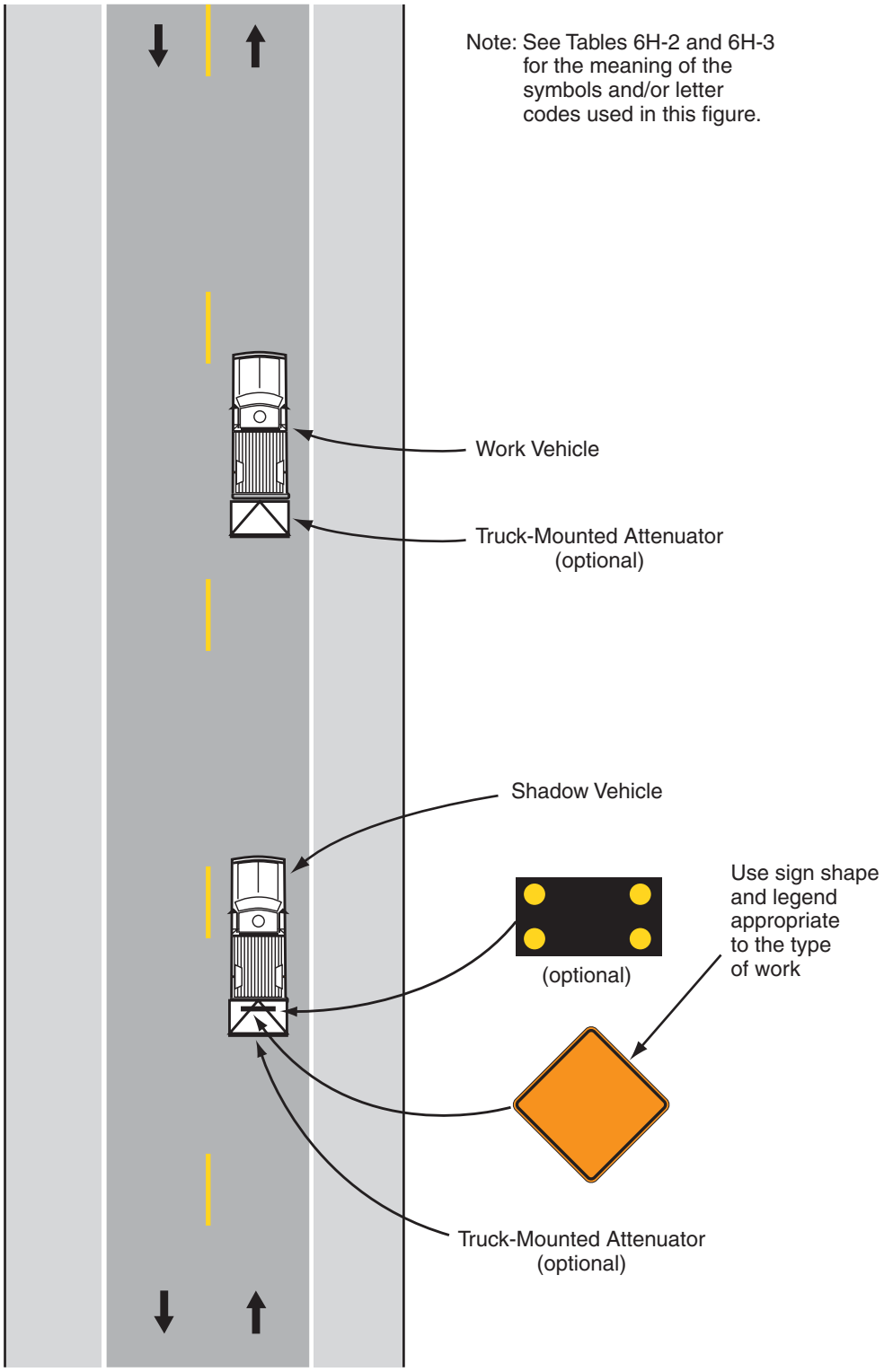
Support:

11. Shadow vehicles are used to warn motor vehicle traffic of the operation ahead.

Standard:

12. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Figure 6H-17. Mobile Operations on Two-Lane Road (TA-17)



Typical Application 17

Notes for Figure 6H-18—Typical Application 18
Lane Closure on Minor Street

Standard:

1. **This TTC shall be used only for low-speed facilities having low traffic volumes.**

Option:

2. Where the work space is short, where road users can see the roadway beyond, and where volume is low, vehicular traffic may be self-regulating.

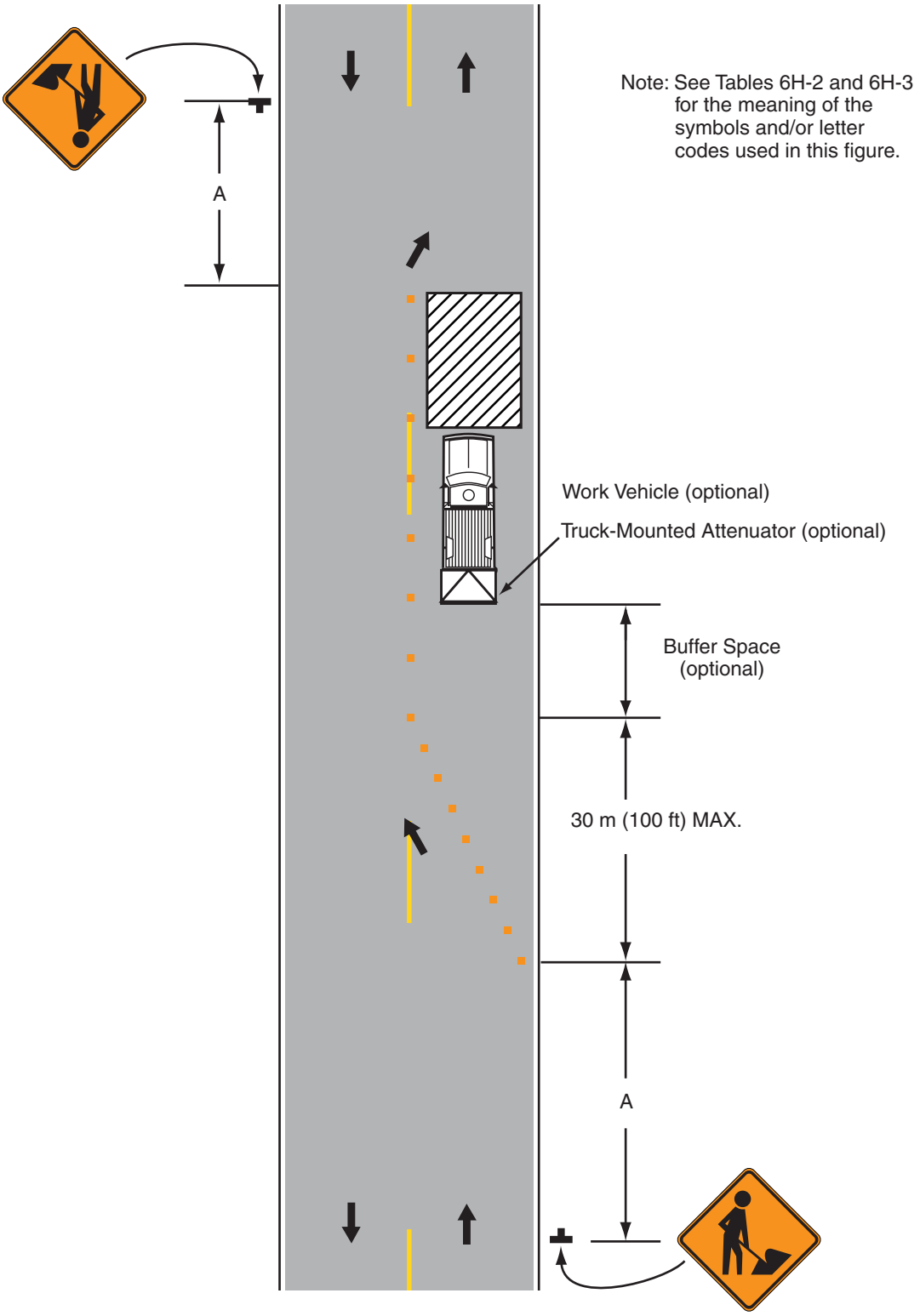
Standard:

3. **Where vehicular traffic cannot effectively self-regulate, one or two flaggers shall be used as illustrated in Figure 6H-10.**

Option:

4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. A truck-mounted attenuator may be used on the work vehicle and the shadow vehicle.

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



Typical Application 18

Notes for Figure 6H-19—Typical Application 19
Detour for One Travel Direction

Guidance:

1. This plan should be used for streets without posted route numbers.
2. On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.

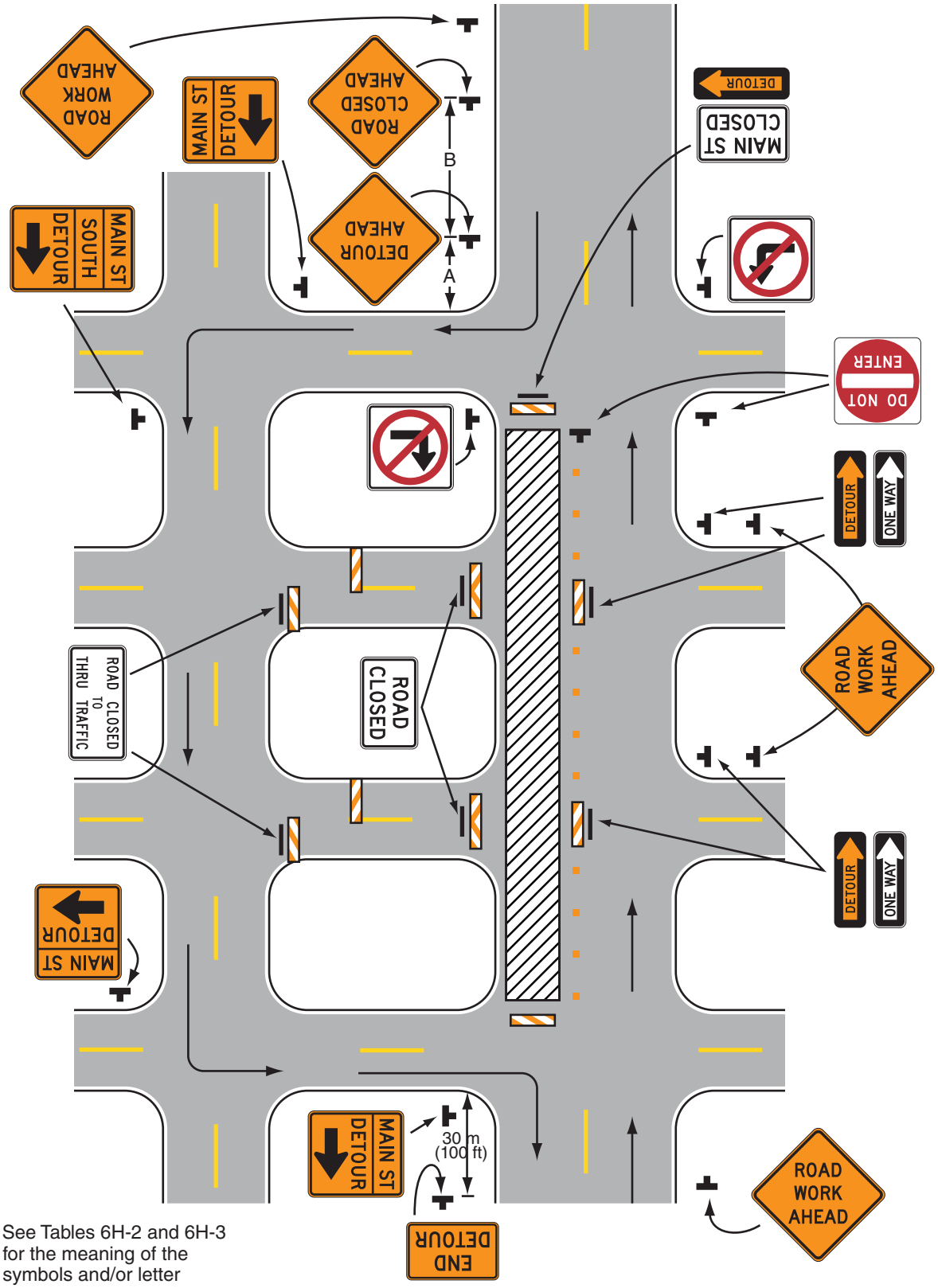
Option:

3. The STREET CLOSED legend may be used in place of ROAD CLOSED.
4. Additional DO NOT ENTER signs may be used at intersections with intervening streets.
5. Warning lights may be used on Type III Barricades.
6. Detour signs may be located on the far side of intersections.
7. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

Standard:

8. When used, the Street Name sign shall be placed above the Detour sign.

Figure 6H-19. Detour for One Travel Direction (TA-19)



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

Typical Application 19

Notes for Figure 6H-20—Typical Application 20
Detour for Closed Street

Guidance:

1. This plan should be used for streets without posted route numbers.
2. On multi-lane streets, Detour signs with an Advance Turn Arrow should be used in advance of a turn.

Option:

3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
4. Flashing warning lights may be used on Type III Barricades.
5. Detour signs may be located on the far side of intersections. A Detour sign with an advance arrow may be used in advance of a turn.
6. A Street Name sign may be mounted with the Detour sign. The Street Name sign may be either white on green or black on orange.

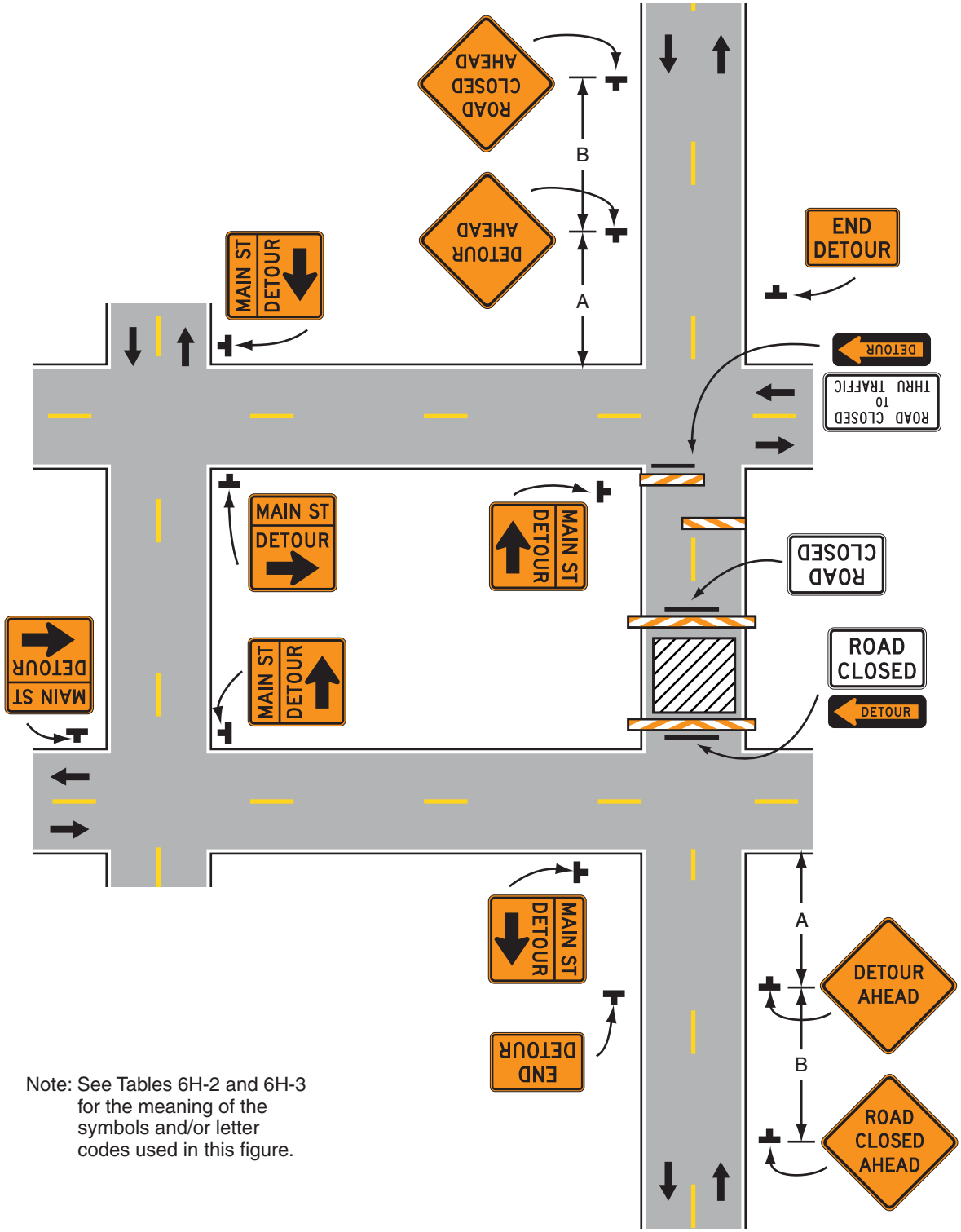
Standard:

7. When used, the Street Name sign shall be placed above the Detour sign.

Support:

8. See Figure 6H-9 for the information for detouring a numbered highway.

Figure 6H-20. Detour for Closed Street (TA-20)



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

Typical Application 20

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

Standard:

1. **The merging taper shall direct vehicular traffic into either the right or left lane, but not both.**

Guidance:

2. In this typical application, a left taper should be used so that right-turn movements will not impede through 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.

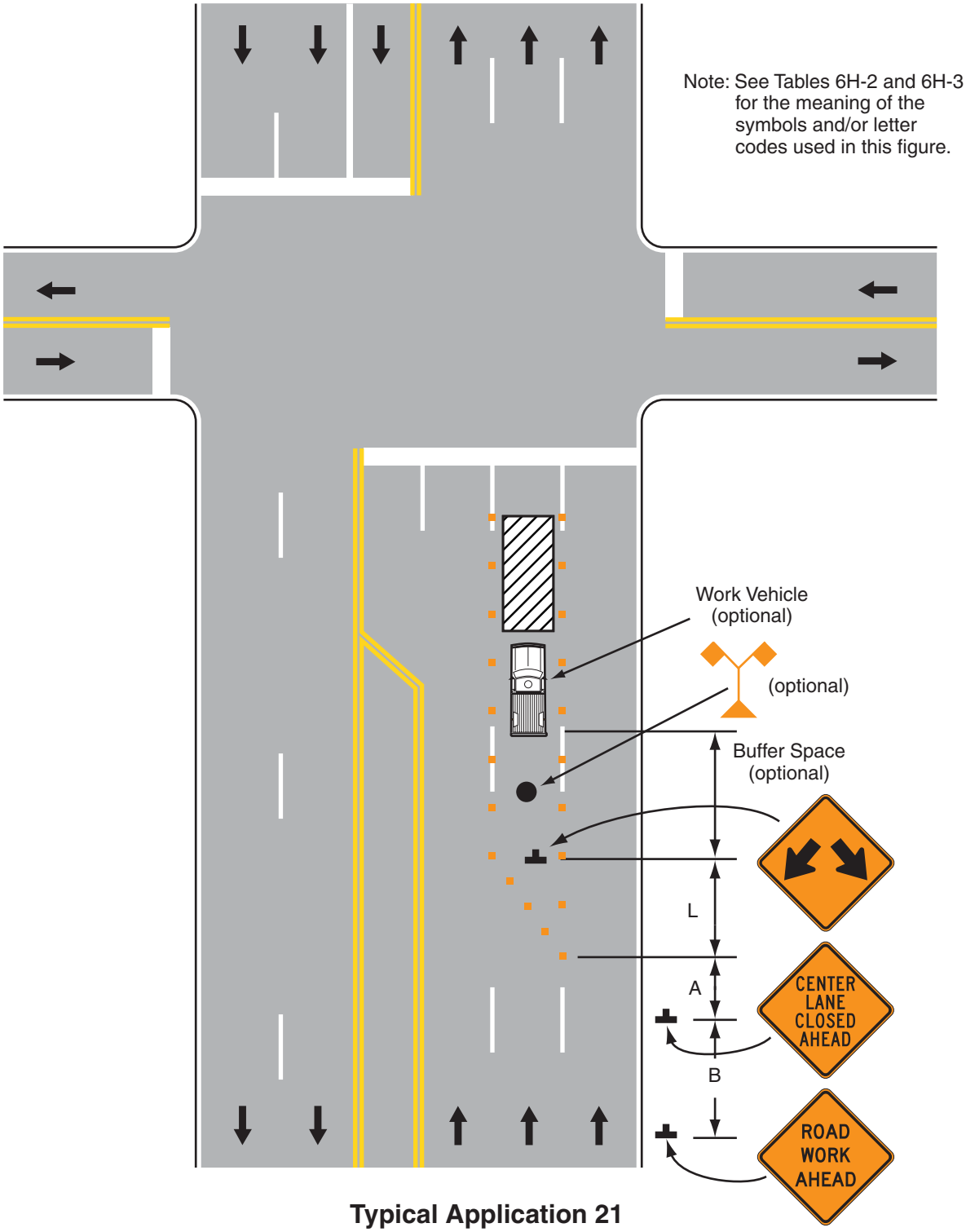
Option:

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.

Standard:

8. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**

Figure 6H-21. Lane Closure on Near Side of Intersection (TA-21)



Typical Application 21

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

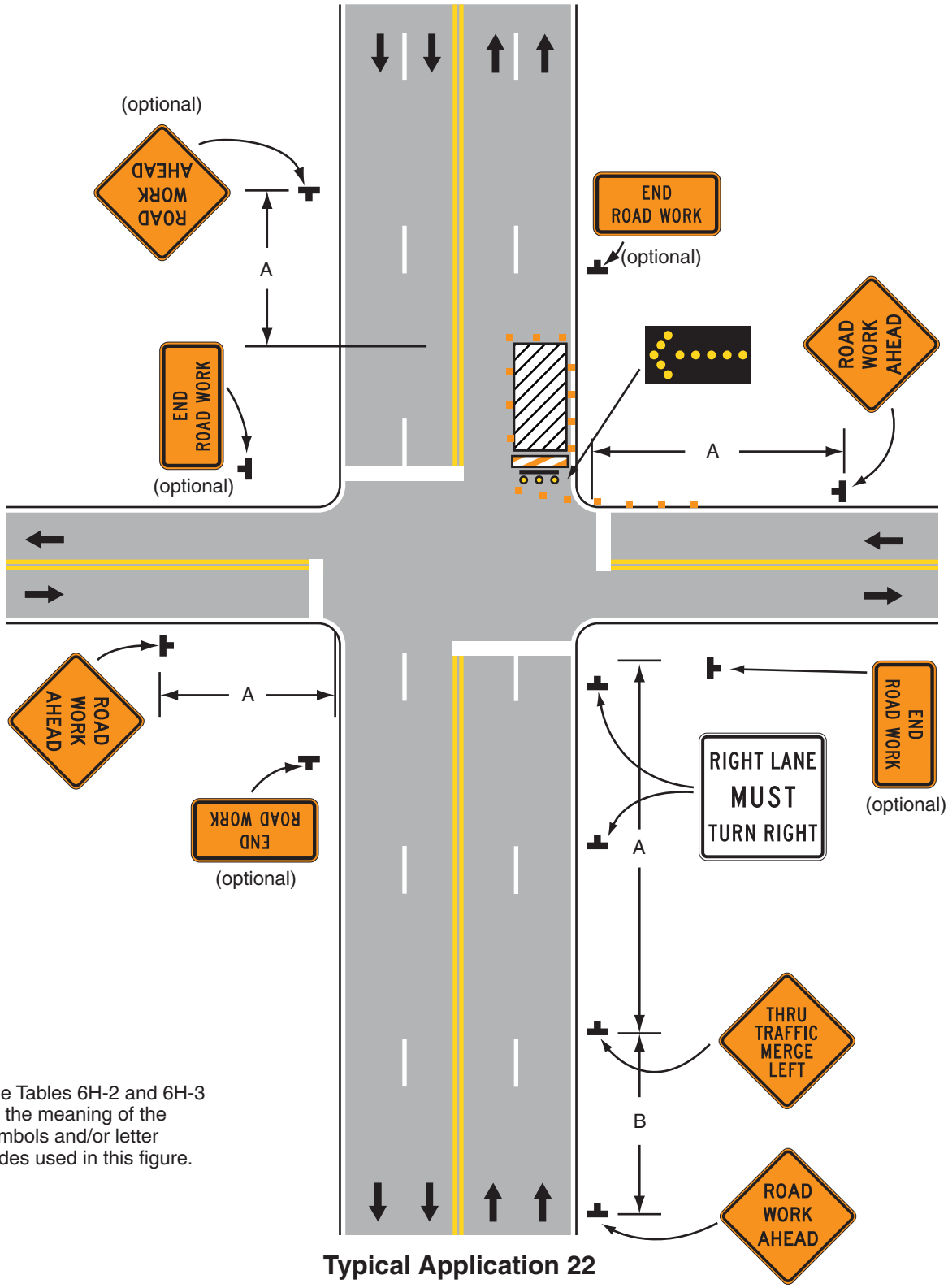
Guidance:

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

Option:

2. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right lane having significant right turning movements, then the right lane may be restricted to right turns only, as shown. This procedure increases the through capacity by eliminating right turns from the open through lane.
3. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. Where the turning radius is large, it may be possible to create a right-turn island using channelizing devices or pavement markings.

Figure 6H-22. Right Lane Closure on Far Side of Intersection (TA-22)



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

Typical Application 22

Notes for Figure 6H-23—Typical Application 23
Left Lane Closure on Far Side of Intersection

Guidance:

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

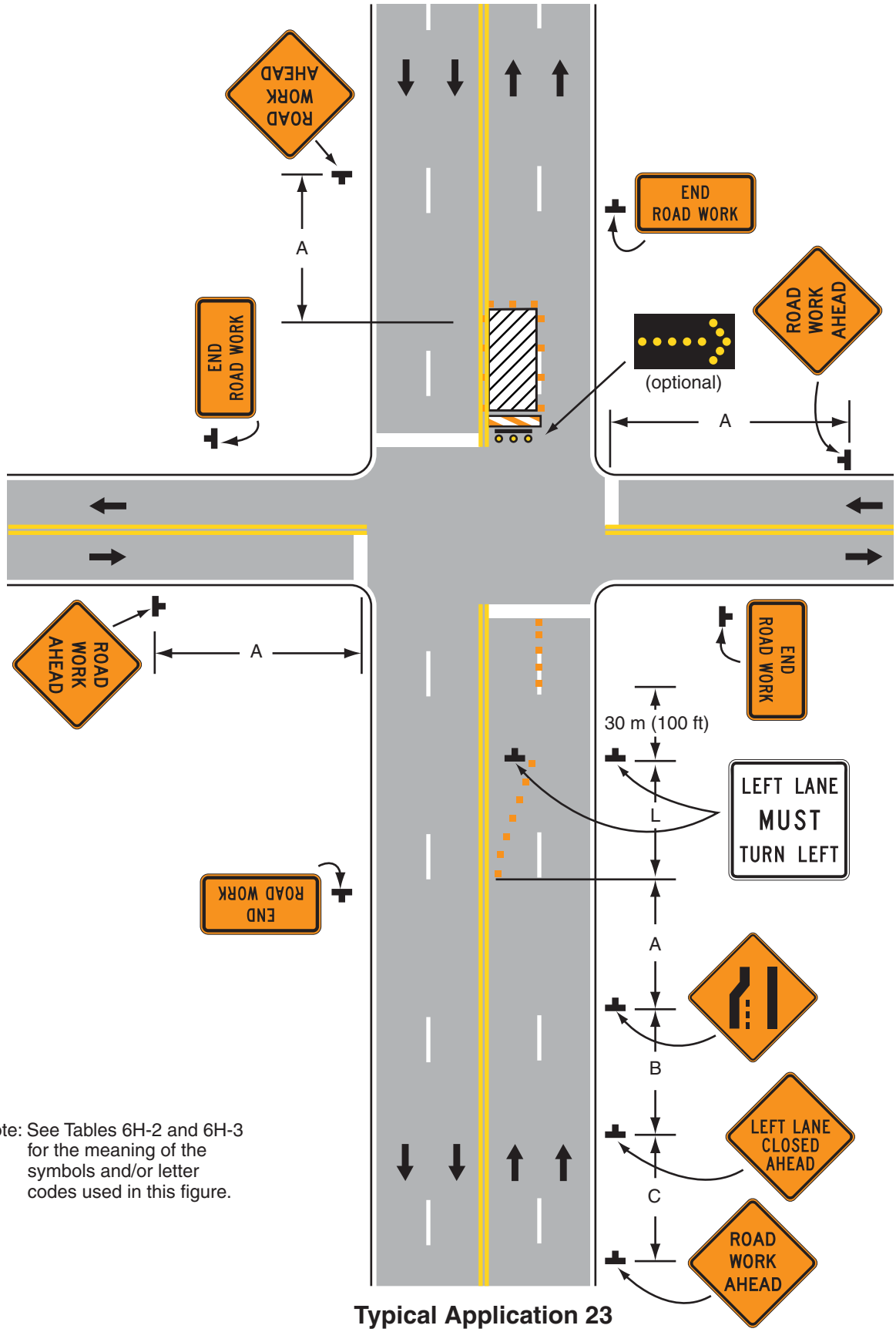
Option:

2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a left lane having significant left-turning movements, then the left lane may be reopened as a turn bay for left turns only, as shown.

Support:

4. By first closing off the left lane and then reopening it as a turn bay, an island is created with channelizing devices that allows the LEFT LANE MUST TURN LEFT sign to be repeated on the left adjacent to the lane that it controls.

Figure 6H-23. Left Lane Closure on Far Side of Intersection (TA-23)



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

Typical Application 23

Notes for Figure 6H-24—Typical Application 24
Half Road Closure on Far Side of Intersection

Guidance:

1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.
2. When turn prohibitions are implemented, two turn prohibition signs should be used, one on the near side and, space permitting, one on the far side of the intersection.

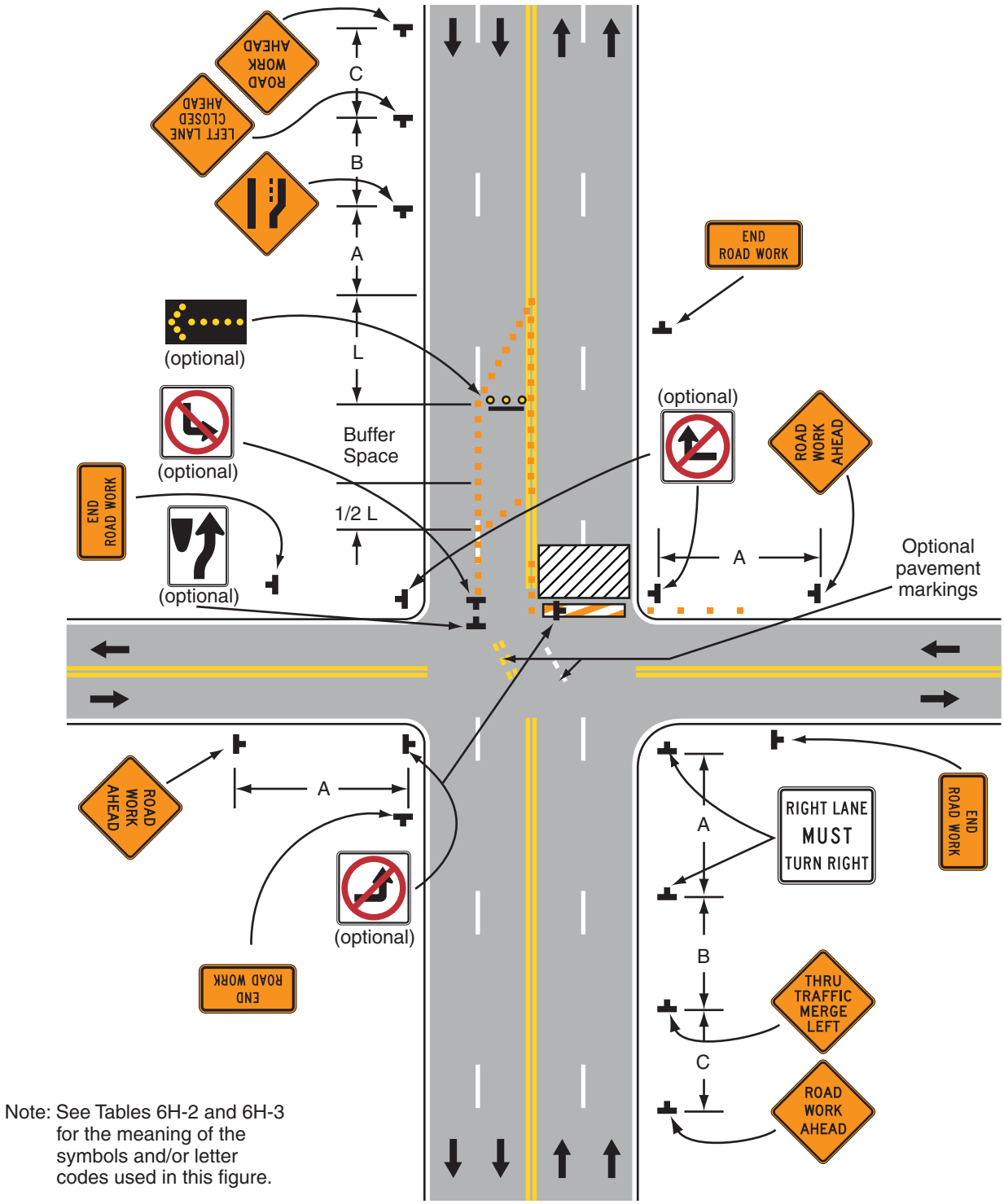
Option:

3. A buffer space may be used between opposing directions of vehicular traffic as shown in this application.
4. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, if there is a significant right-turning movement, then the right lane may be restricted to right turns only, as shown.
5. Where the turning radius is large, a right-turn island using channelizing devices or pavement markings may be used.
6. There may be insufficient space to place the back-to-back Keep Right sign and No Left Turn symbol signs at the end of the row of channelizing devices separating opposing vehicular traffic flows. In this situation, the No Left Turn symbol sign may be placed on the right and the Keep Right sign may be omitted.
7. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.
8. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
9. Temporary pavement markings may be used to delineate the travel path through the intersection.

Support:

10. Keeping the right lane open increases the through capacity by eliminating right turns from the open through lane.
11. A temporary turn island reinforces the nature of the temporary exclusive right-turn lane and enables a second RIGHT LANE MUST TURN RIGHT sign to be placed in the island.

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



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

Typical Application 24

Notes for Figure 6H-25—Typical Application 25
Multiple Lane Closures at Intersection

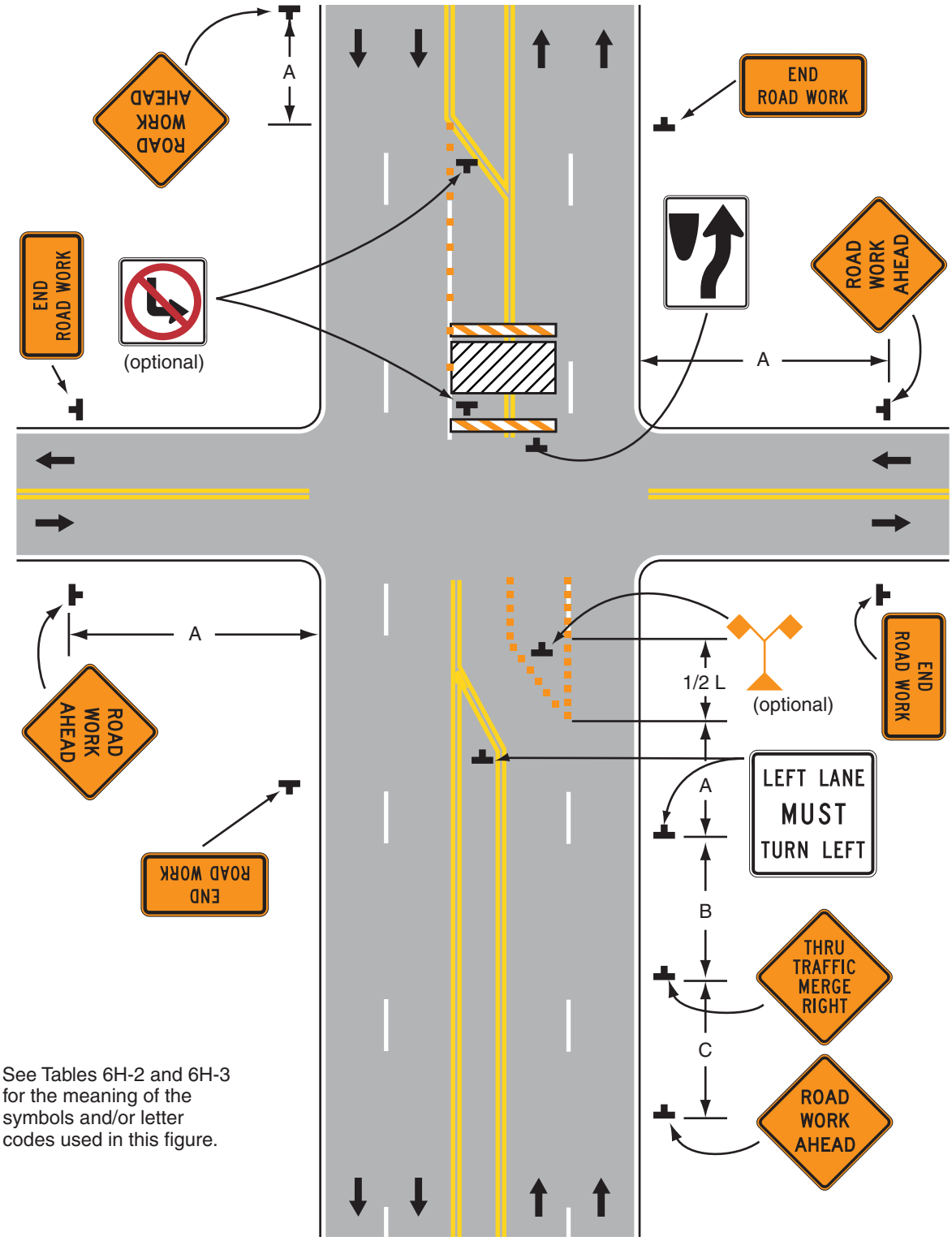
Guidance:

1. If the work space extends across a crosswalk, the crosswalk should be closed using the information and devices shown in Figure 6H-29.
2. If the left through lane is closed on the near-side approach, the LEFT LANE MUST TURN LEFT sign should be placed in the median to discourage through vehicular traffic from entering the left-turn bay.

Option:

3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. If the left-turning movement that normally uses the closed turn bay is small and/or the gaps in opposing vehicular traffic are frequent, left turns may be permitted on that approach.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.

Figure 6H-25. Multiple Lane Closures at Intersection (TA-25)



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

Typical Application 25

Notes for Figure 6H-26—Typical Application 26
Closure in Center of Intersection

Guidance:

1. All lanes should be a minimum of 3 m (10 ft) in width as measured to the near face of the channelizing devices.

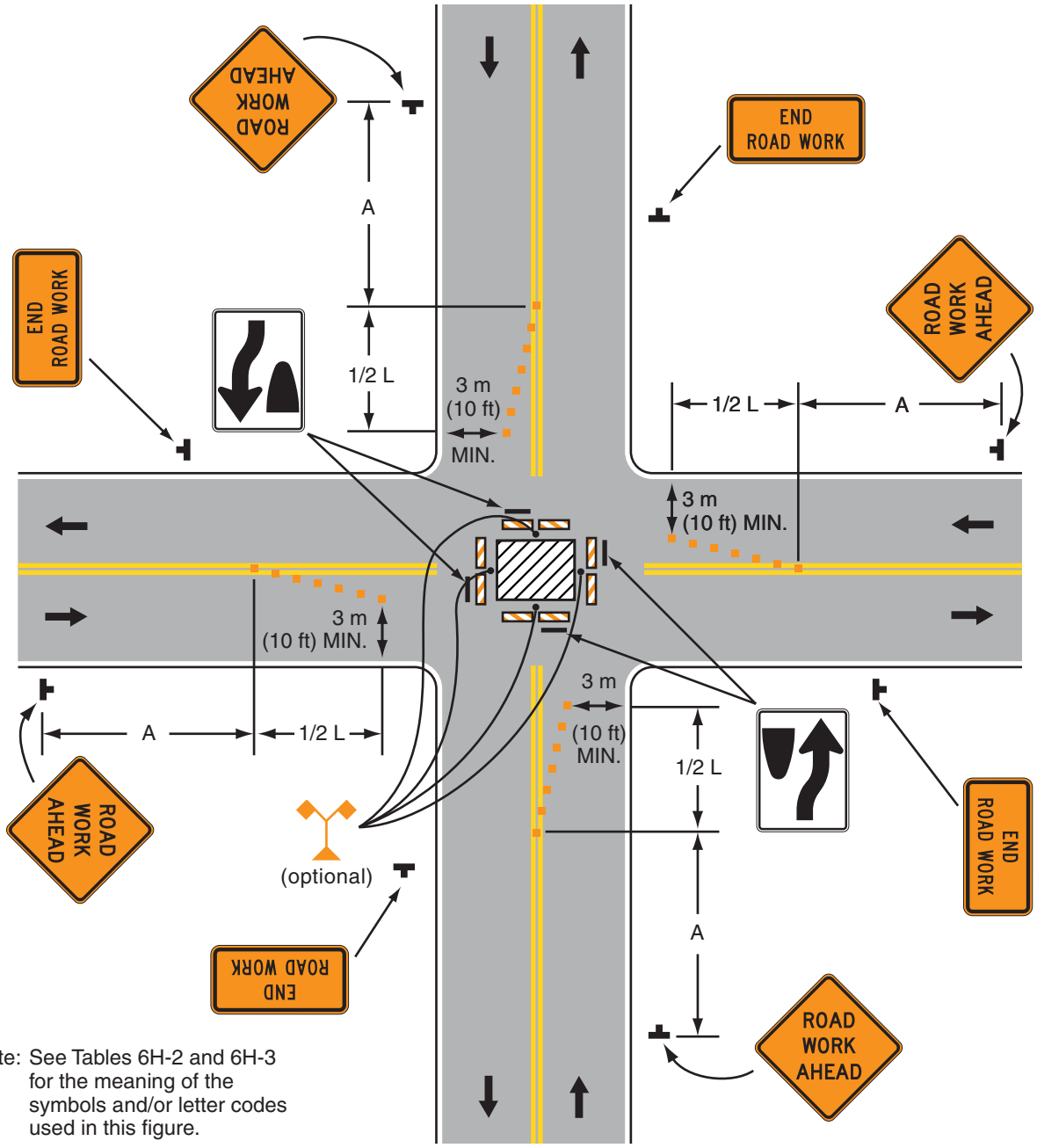
Option:

2. A high-level warning device may be placed in the work space, if there is sufficient room.
3. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 2.7 m (9 ft) may be used.
4. Flashing warning lights and/or flags may be used to call attention to advance warning signs.
5. Unless the streets are wide, it may be physically impossible to turn left, especially for large vehicles. Left turns may be prohibited as required by geometric conditions.
6. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
7. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

8. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

Figure 6H-26. Closure in Center of Intersection (TA-26)



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

Typical Application 26

Notes for Figure 6H-27—Typical Application 27
Closure at Side of Intersection

Guidance:

1. The situation depicted can be simplified by closing one or more of the intersection approaches. If this cannot be done, and/or when capacity is a problem, through vehicular traffic should be directed to other roads or streets.
2. Depending on road user conditions, flagger(s) or uniformed law enforcement officer(s) should be used to direct road users within the intersection.

Standard:

3. At night, flagger stations shall be illuminated, except in emergencies.

Option:

4. ONE LANE ROAD AHEAD signs may also be used to provide adequate advance warning.
5. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
6. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
7. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:

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

Support:

9. Turns can be prohibited as required by vehicular traffic conditions. Unless the streets are wide, it might be physically impossible to make certain turns, especially for large vehicles.

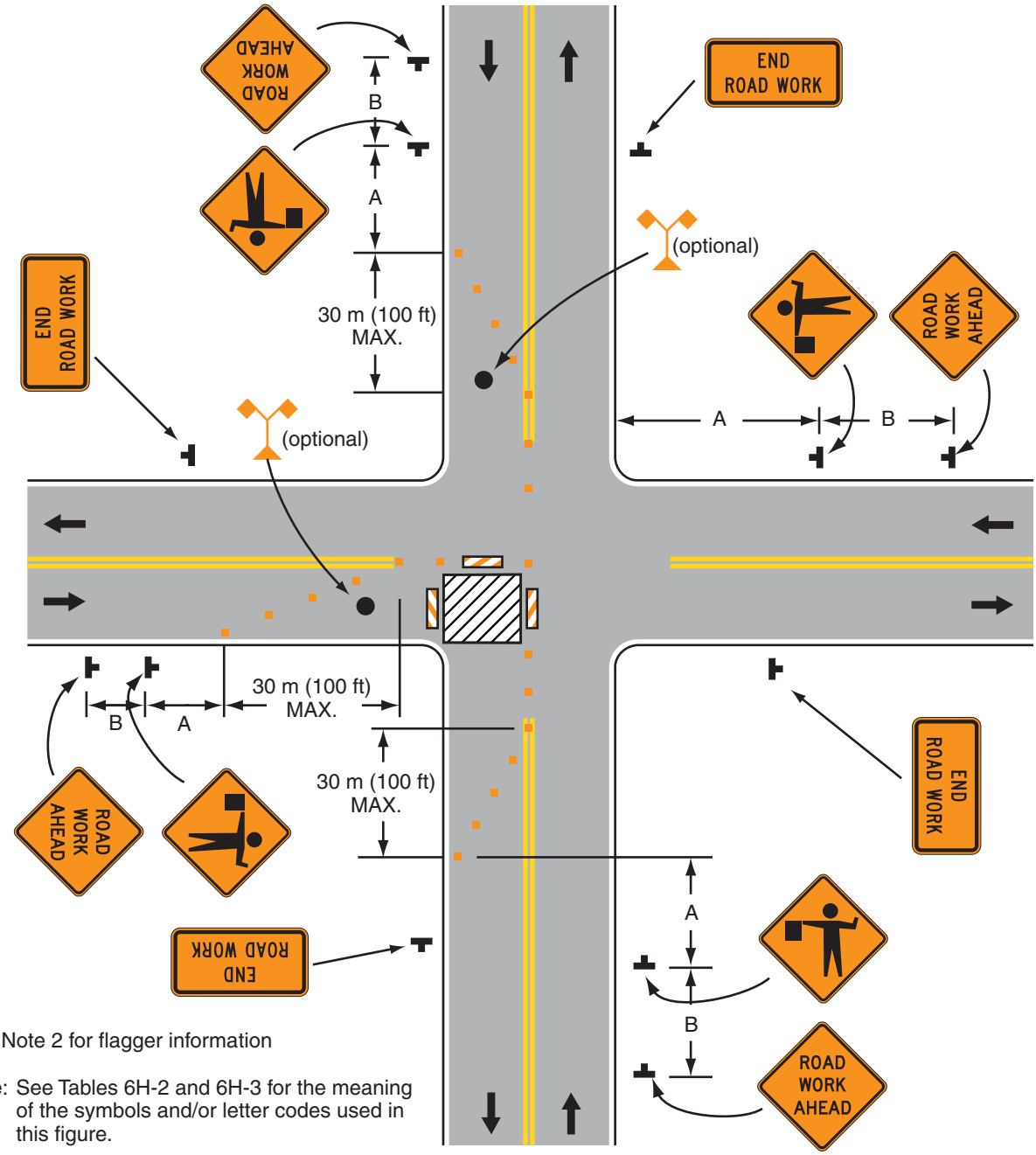
Option:

10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

11. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

Figure 6H-27. Closure at Side of Intersection (TA-27)



See Note 2 for flagger information

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

Typical Application 27

Notes for Figure 6H-28—Typical Application 28
Sidewalk Closures and Bypass Sidewalks

Standard:

1. **When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.**

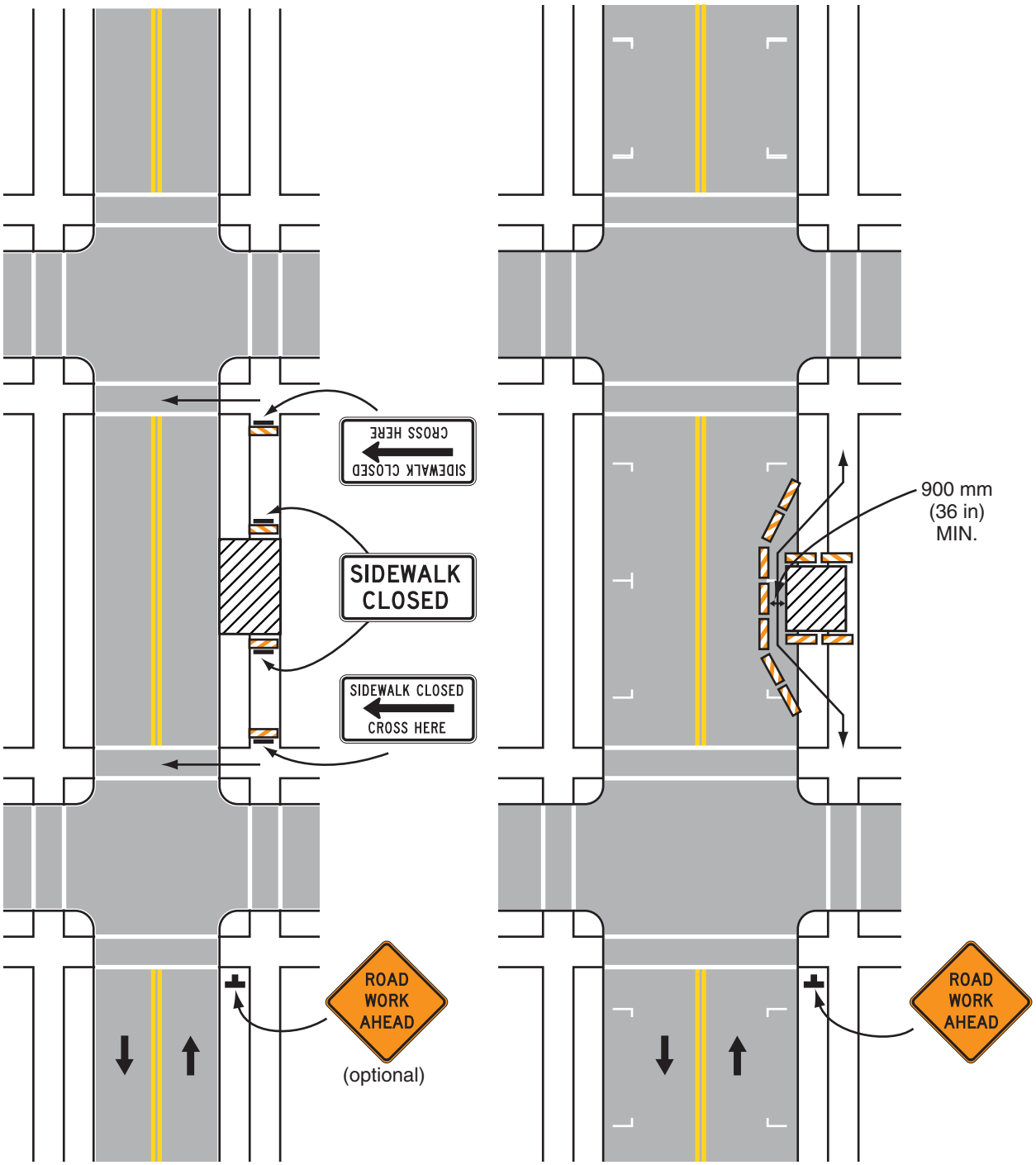
Guidance:

2. Where high speeds are anticipated, a temporary traffic barrier and, if necessary, a crash cushion should be used to separate the temporary sidewalks from vehicular traffic.
3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.

Option:

4. Street lighting may be considered.
5. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
6. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.
7. Type C Steady-Burn or Type D 360-degree Steady-Burn warning lights may be used on channelizing devices separating the temporary sidewalks from vehicular traffic flow.
8. Signs, such as KEEP RIGHT (LEFT), may be placed along a temporary sidewalk to guide or direct pedestrians.

Figure 6H-28. Sidewalk Detour or Diversion (TA-28)



Typical Application 28

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

Notes for Figure 6H-29—Typical Application 29
Crosswalk Closures and Pedestrian Detours

Standard:

1. **When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.**
2. **Curb parking shall be prohibited for at least 15 m (50 ft) in advance of the midblock crosswalk.**

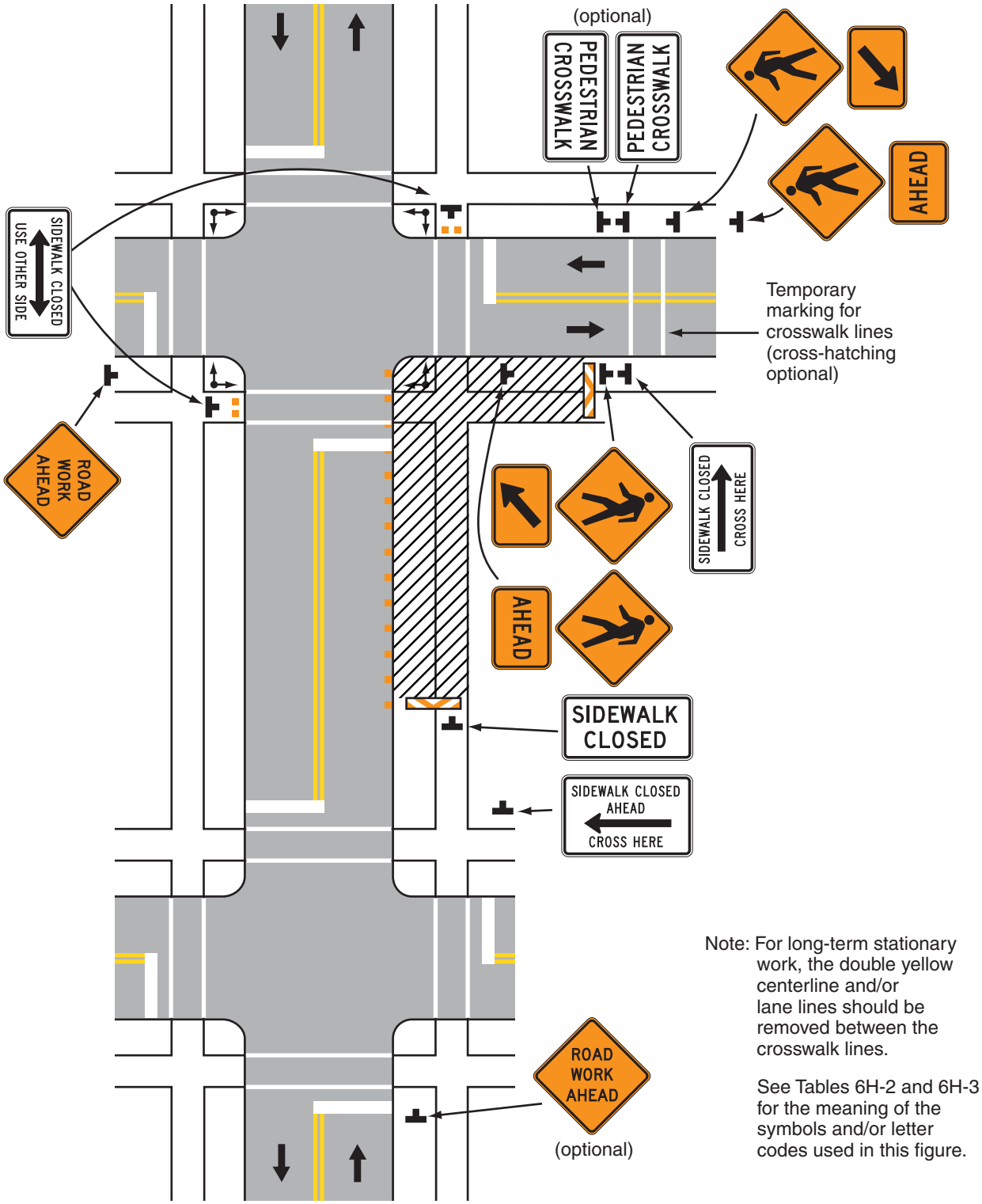
Guidance:

3. Audible information devices should be considered where midblock closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians who have visual disabilities.
4. Pedestrian traffic signal displays controlling closed crosswalks should be covered or deactivated.

Option:

5. Street lighting may be considered.
6. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS signs, may be used to control vehicular traffic.
7. For nighttime closures, Type A Flashing warning lights may be used on barricades supporting signs and closing sidewalks.
8. Type C Steady-Burn warning lights may be used on channelizing devices separating the work space from vehicular traffic.
9. In order to maintain the systematic use of the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs in a jurisdiction, the fluorescent yellow-green background for pedestrian, bicycle, and school warning signs may be used in TTC zones.

Figure 6H-29. Crosswalk Closures and Pedestrian Detours (TA-29)



Note: For long-term stationary work, the double yellow centerline and/or lane lines should be removed between the crosswalk lines.

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

Typical Application 29

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

Guidance:

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

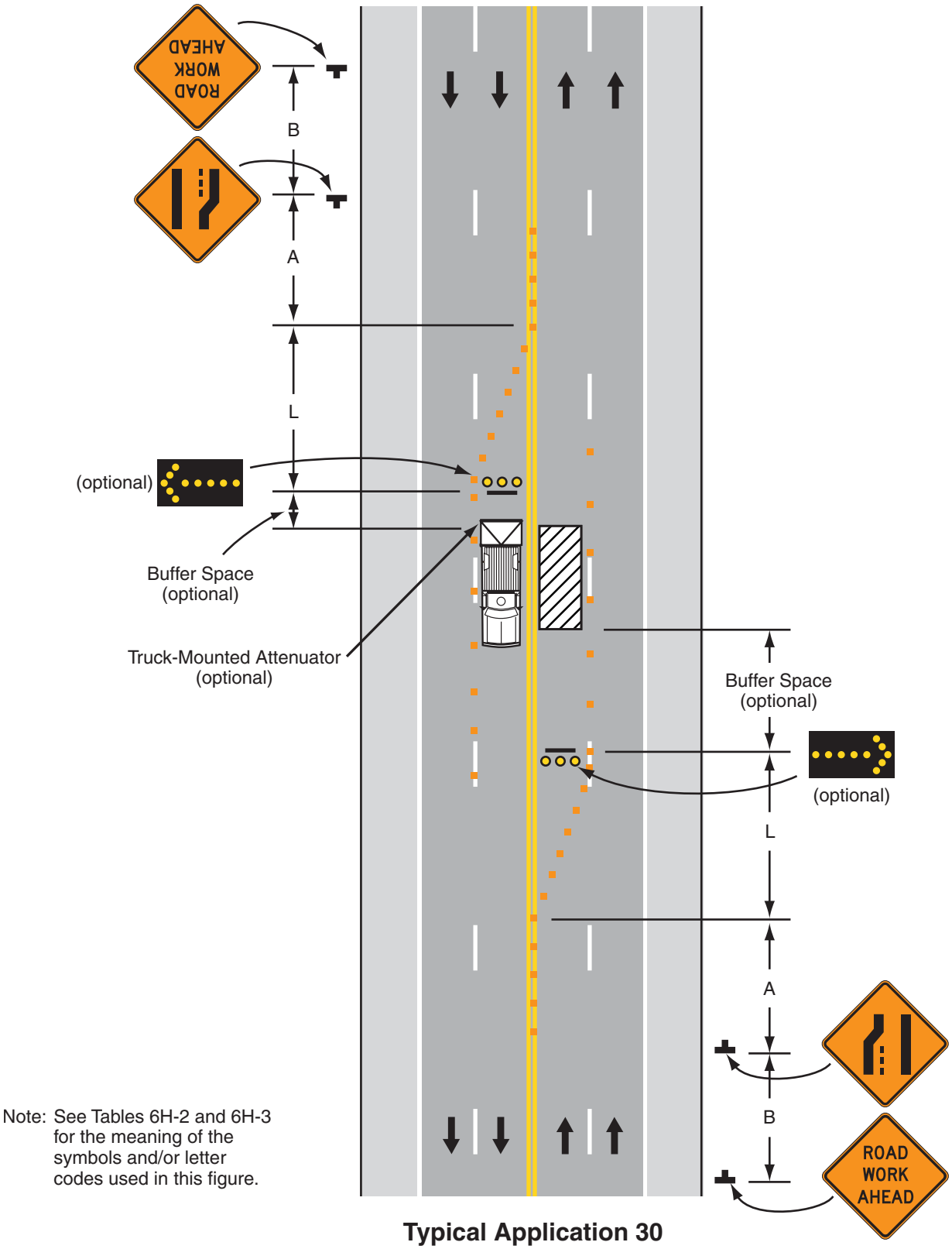
Option:

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.

Guidance:

4. When a highway-rail grade crossing exists within or upstream of the transition area and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the transition area precedes the highway-rail grade crossing.
5. Early coordination with the railroad company should occur before work starts.

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



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

Typical Application 30

Notes for Figure 6H-31—Typical Application 31
Lane Closure on Street with Uneven Directional Volumes

Standard:

1. **The illustrated information shall be used only when the vehicular traffic volume indicates that two lanes of vehicular traffic shall be maintained in the direction of travel for which one lane is closed.**

Option:

2. The procedure may be used during a peak period of vehicular traffic and then changed to provide two lanes in the other direction for the other peak.

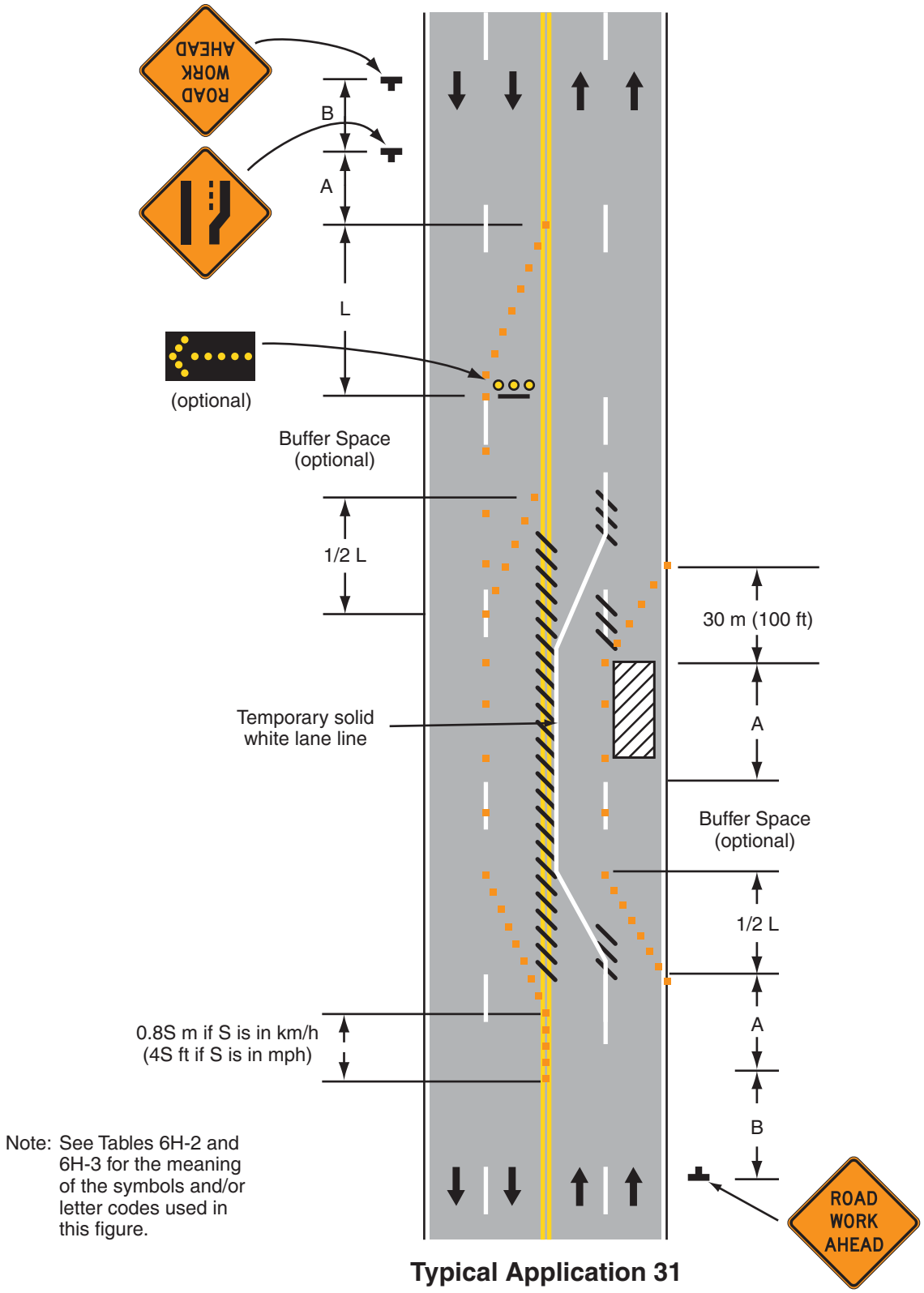
Guidance:

3. For high speeds, a LEFT LANE CLOSED XX m (FT) sign should be added for vehicular traffic approaching the lane closure, as shown in Figure 6H-32.
4. Conflicting pavement markings should be removed for long-term projects. For short-term and intermediate-term projects where this is not practical, the channelizing devices in the area where the pavement markings conflict should be placed at a maximum spacing of 0.1 S m (0.5 S ft) where S is the speed in km /h (mph). Temporary markings should be installed where needed.
5. If the lane shift has curves with recommended speeds of 50 km/h (30 mph) or less, Reverse Turn signs should be used.
6. Where the shifted section is long, a Reverse Curve sign should be used to show the initial shift and a second sign should be used to show the return to the normal alignment.
7. If the tangent distance along the temporary diversion is less than 180 m (600 ft), the Double Reverse Curve sign should be used at the location of the first Two Lane Reverse Curve sign. The second Two Lane Reverse Curve sign should be omitted.

Option:

8. A longitudinal buffer space may be used in the activity area to separate opposing vehicular traffic.
9. An ALL LANES THRU supplemental plaque may be used to emphasize the point that all lanes shift and no lanes are closed.
10. A work vehicle or a shadow vehicle may be equipped with a truck-mounted attenuator.

Figure 6H-31. Lane Closures on Street with Uneven Directional Volumes (TA-31)



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

Typical Application 31

Notes for Figure 6H-32—Typical Application 32
Half Road Closure on Multi-lane, High-Speed Highway

Standard:

1. **Pavement markings no longer applicable shall be removed or obliterated as soon as practical. Except for intermediate-term and short-term situations, temporary markings shall be provided to clearly delineate the temporary travel path. For short-term and intermediate-term situations where it is not feasible to remove and restore pavement markings, channelization shall be made dominant by using a very close device spacing.**

Guidance:

2. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
3. Where channelizing devices are used instead of pavement markings, the maximum spacing should be 0.1 S meters where S is the speed in km/h (0.5 S feet where S is the speed in mph).
4. If the tangent distance along the temporary diversion is more than 180 m (600 ft), a Reverse Curve sign, left first, should be used instead of the Double Reverse Curve sign, and a second Reverse Curve sign, right first, should be placed in advance of the second reverse curve back to the original alignment.

Option:

5. Warning lights may be used to supplement channelizing devices at night.

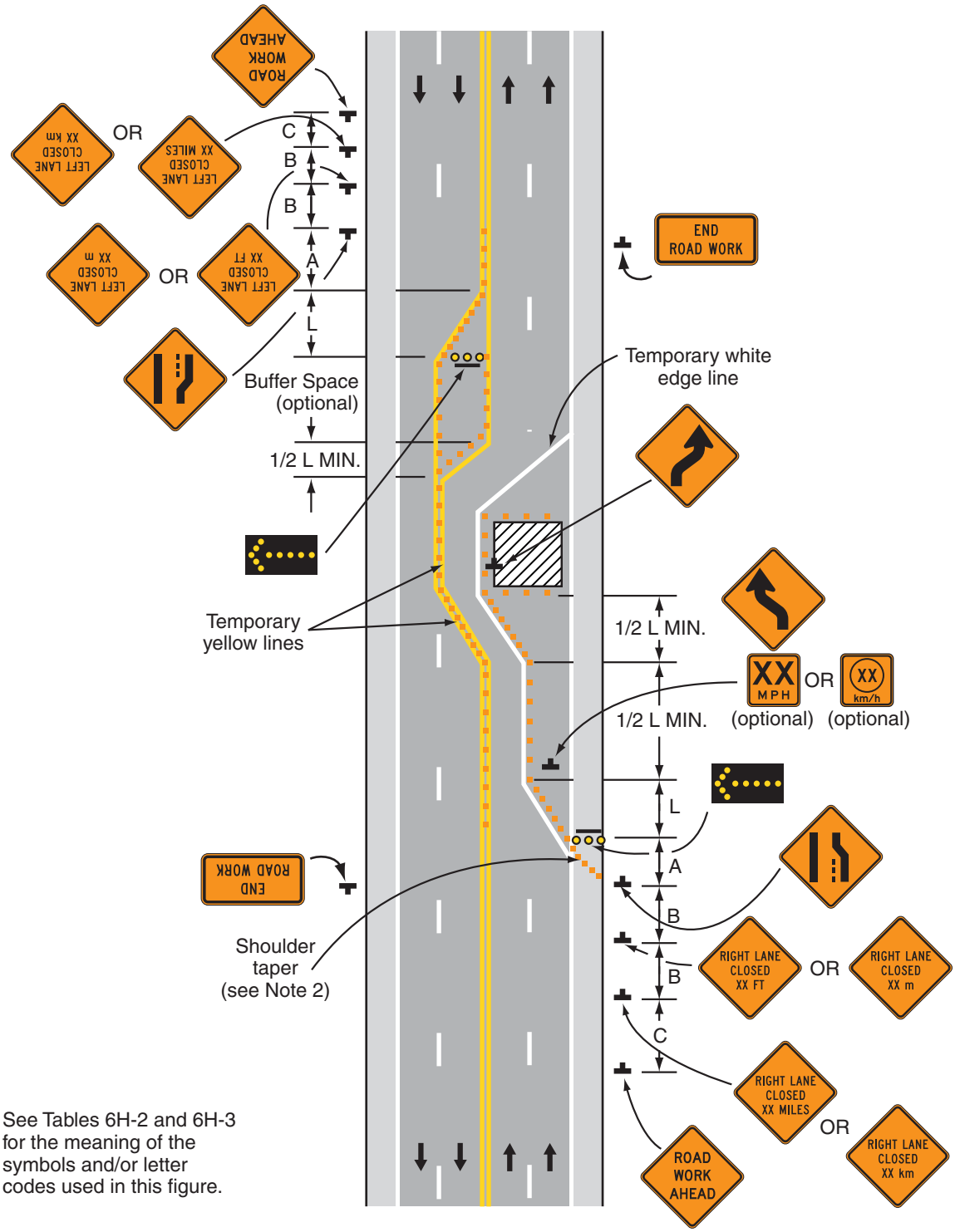
Guidance:

6. When a highway-rail grade crossing exists within or upstream of the merging taper and it is anticipated that backups resulting from the lane closure might extend through the highway-rail grade crossing, the TTC zone should be extended so that the merging taper precedes the highway-rail grade crossing.
7. When a highway-rail grade crossing exists within the activity area, provisions should be made to provide road users operating on the left side of the normal centerline with comparable warning devices as supplied for road users operating on the right side of the normal centerline.
8. When a highway-rail grade crossing exists within the activity area, early coordination with the railroad company should occur before work starts.

Option:

9. When a highway-rail grade crossing exists within the activity area, a flagger may be used at the highway-rail grade crossing to minimize the probability that vehicles are stopped within 4.6 m (15 ft) of the highway-rail grade crossing, measured from both sides of the outside rails.
10. A truck-mounted attenuator may be used on the work vehicle and/or the shadow vehicle.

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



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

Typical Application 32

Notes for Figure 6H-33—Typical Application 33
Stationary Lane Closure on Divided Highway

Standard:

1. **This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.**
2. **When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed as needed.**

Guidance:

3. When paved shoulders having a width of 2.4 m (8 ft) or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.

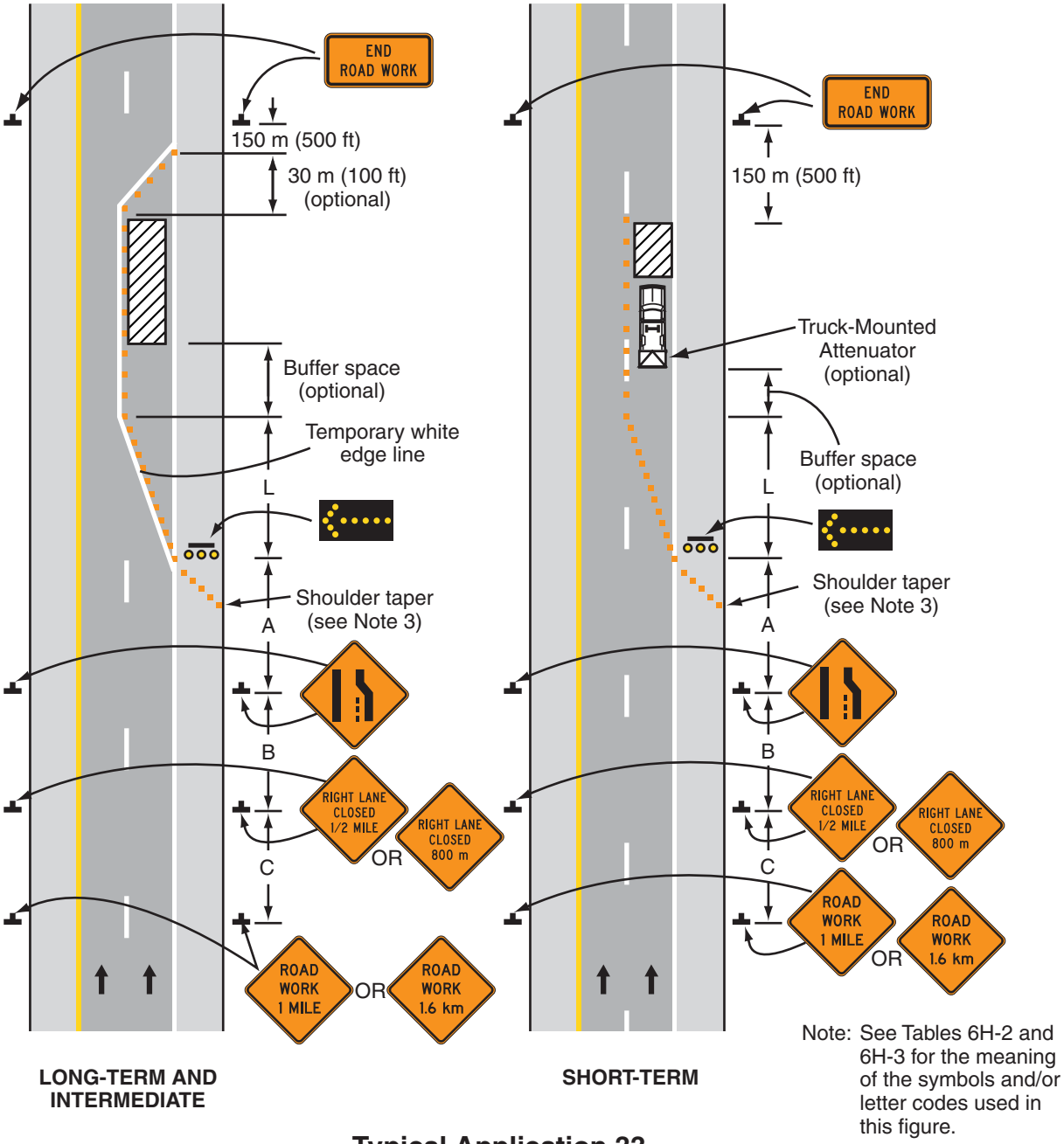
Option:

4. A truck-mounted attenuator may be used on the work vehicle and/or shadow vehicle.

Support:

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

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



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

Typical Application 33

Notes for Figure 6H-34—Typical Application 34
Lane Closure with Temporary Traffic Barrier

Standard:

1. **This information also shall be used when work is being performed in the lane adjacent to the median on a divided highway. In this case, the LEFT LANE CLOSED signs and the corresponding Lane Ends signs shall be substituted.**

Guidance:

2. For long-term lane closures on facilities with permanent edge lines, a temporary edge line should be installed from the start of the merging taper to the far end of the downstream taper, and conflicting pavement markings should be removed.
3. The use of a barrier should be based on engineering judgment.

Standard:

4. **Where temporary traffic barriers are installed, the ends of the barrier shall be treated in accordance with the provisions of Section 6F.81**
5. **The barrier shall not be placed along the merging taper. The lane shall first be closed using channelizing devices and pavement markings.**

Option:

6. The barrier shown in this typical application is an example of one method that may be used to close a lane for a long-term project. If the work activity permits, a movable barrier may be used and relocated to the shoulder during nonwork periods or peak-period vehicular traffic conditions, as appropriate.
7. Type C Steady-Burn warning lights may be placed on channelizing devices and the barrier parallel to the edge of pavement for nighttime lane closures.

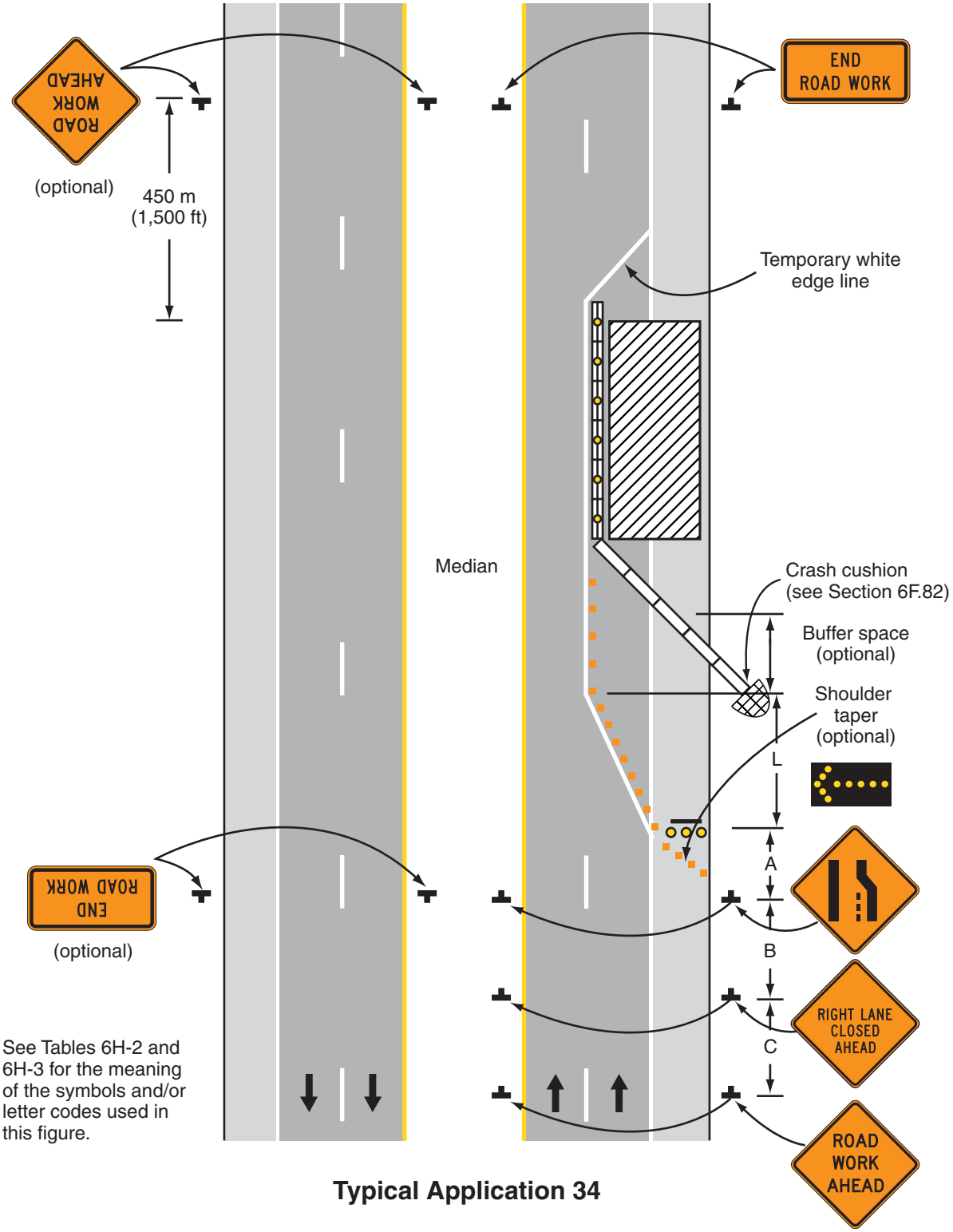
Standard:

8. **If a movable barrier is used, the temporary white edge line shown in the typical application shall not be used. During the period when the right lane is opened, the sign legends and the channelization shall be changed to indicate that only the shoulder is closed, as illustrated in Figure 6H-5. The arrow panel, if used, shall be placed at the end of the shoulder taper and shall display the caution mode.**

Guidance:

9. If a movable barrier is used, the shift should be performed in the following manner. When closing the lane, the lane should be initially closed with channelizing devices placed along a merging taper using the same information employed for a stationary lane closure. The lane closure should then be extended with the movable-barrier transfer vehicle moving with vehicular traffic. When opening the lane, the movable-barrier transfer vehicle should travel against vehicular traffic from the termination area to the transition area. The merging taper should then be removed using the same information employed for a stationary lane closure.

Figure 6H-34. Lane Closure with Temporary Traffic Barrier (TA-34)



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

Typical Application 34

Notes for Figure 6H-35—Typical Application 35
Mobile Operation on Multi-lane Road

Standard:

1. **Arrow panels shall, as a minimum, be Type B, with a size of 1500 x 750 mm (60 x 30 in).**

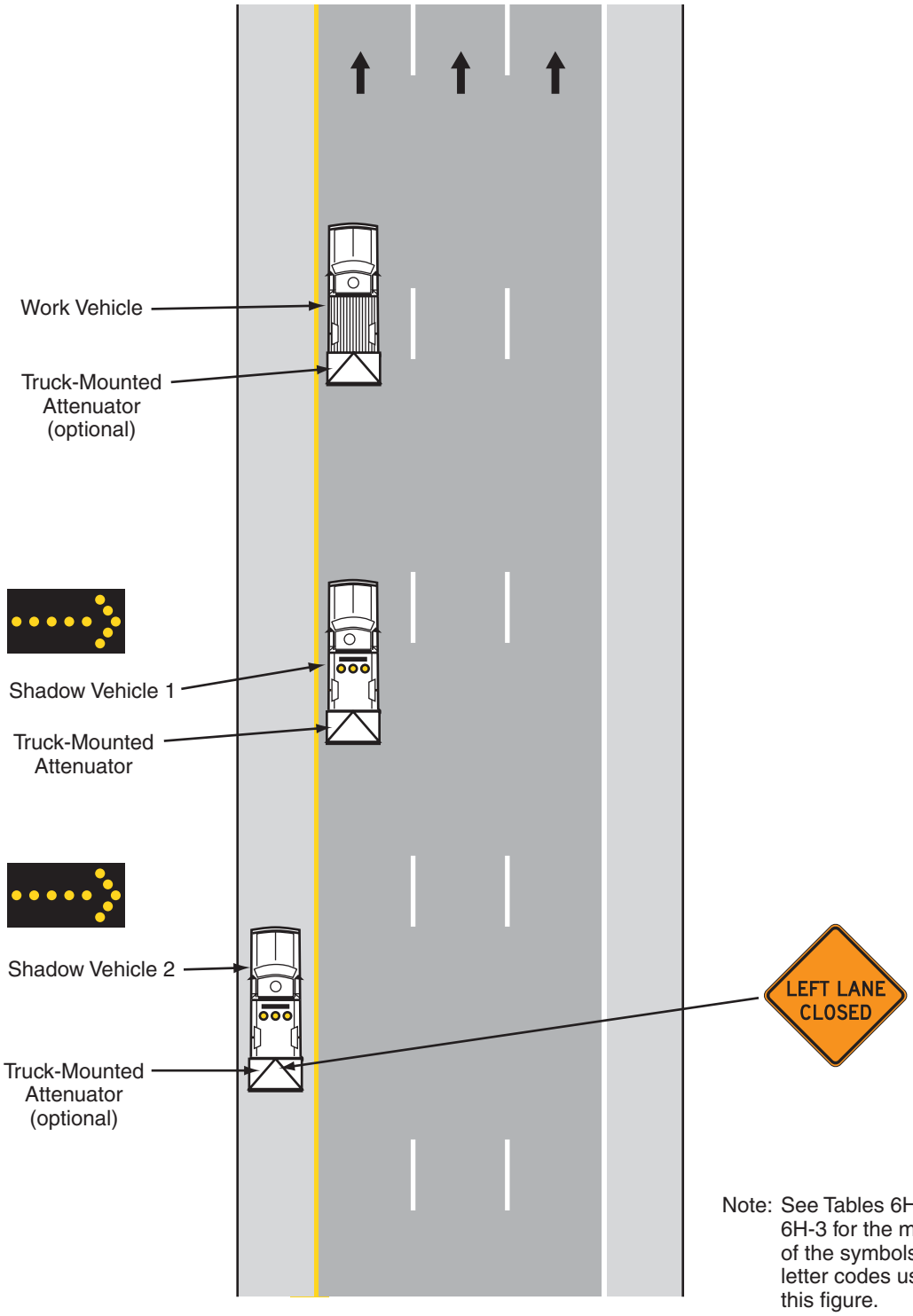
Guidance:

2. Vehicles used for these operations should be made highly visible with appropriate equipment, such as: high-intensity rotating, flashing, oscillating, or strobe lights, flags, signs, or arrow panels.
3. Shadow Vehicle 1 should be equipped with an arrow panel and truck-mounted attenuator.
4. Shadow Vehicle 2 should be equipped with an arrow panel. An appropriate lane closure sign should be placed on Shadow Vehicle 2 so as not to obscure the arrow panel.
5. Shadow Vehicle 2 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.
6. The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.
7. Work should normally be accomplished during off-peak hours.
8. When the work vehicle occupies an interior lane (a lane other than the far right or far left) of a directional roadway having a right shoulder 3 m (10 ft) or more in width, Shadow Vehicle 2 should drive the right shoulder with a sign indicating that work is taking place in the interior lane.

Option:

9. A truck-mounted attenuator may be used on Shadow Vehicle 2.
10. On high-speed roadways, a third shadow vehicle (not shown) may be used with Shadow Vehicle 1 in the closed lane, Shadow Vehicle 2 straddling the edge line, and Shadow Vehicle 3 on the shoulder.
11. Where adequate shoulder width is not available, Shadow Vehicle 3 may drive partially in the lane.

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



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

Typical Application 35

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

Guidance:

1. The lane shift should be used when the work space extends into either the right or left lane of a divided highway and it is not practical, for capacity reasons, to reduce the number of available lanes.
2. When a lane shift is accomplished by using (1) geometry that meets the design speed at which the permanent highway was designed, (2) full normal cross-section (full lane width and full shoulders), and (3) complete pavement markings, then only the initial general work-zone warning sign is required.
3. When the conditions in Note 2 are not met, the information shown in the typical application should be employed and all the following notes apply.

Standard:

4. **Where temporary traffic barriers are installed, the ends of the barrier shall be treated in accordance with the provisions of Section 6F.81.**
5. **A warning sign shall be used to show the changed alignment.**

Guidance:

6. Where the shifted section is longer than 180 m (600 ft), one set of Reverse Curve signs should be used to show the initial shift and a second set should be used to show the return to the normal alignment. If the tangent distance along the temporary diversion is less than 180 m (600 ft), the Double Reverse Curve sign should be used instead of the first Reverse Curve sign. The second Reverse Curve sign should be omitted.
7. If a STAY IN LANE sign is used, then solid white lane lines should be used.

Standard:

8. **The minimum width of the shoulder lane shall be 3 m (10 ft).**
9. **For long-term stationary work, existing conflicting pavement markings shall be removed and temporary markings shall be installed before traffic patterns are changed.**

Option:

10. For short-term stationary work, lanes may be delineated by channelizing devices or removable pavement markings instead of temporary pavement markings.
11. Three Lane Reverse Curve signs may be used in place of the Reverse Curve signs. ALL LANES THRU supplemental plaques may be used to emphasize the point that all lanes shift and no lanes are closed.
12. If the shoulder cannot adequately accommodate trucks, trucks may be directed to use the travel lanes.
13. The barrier shown in this typical application is one method that may be used to close a lane for a long-term project.

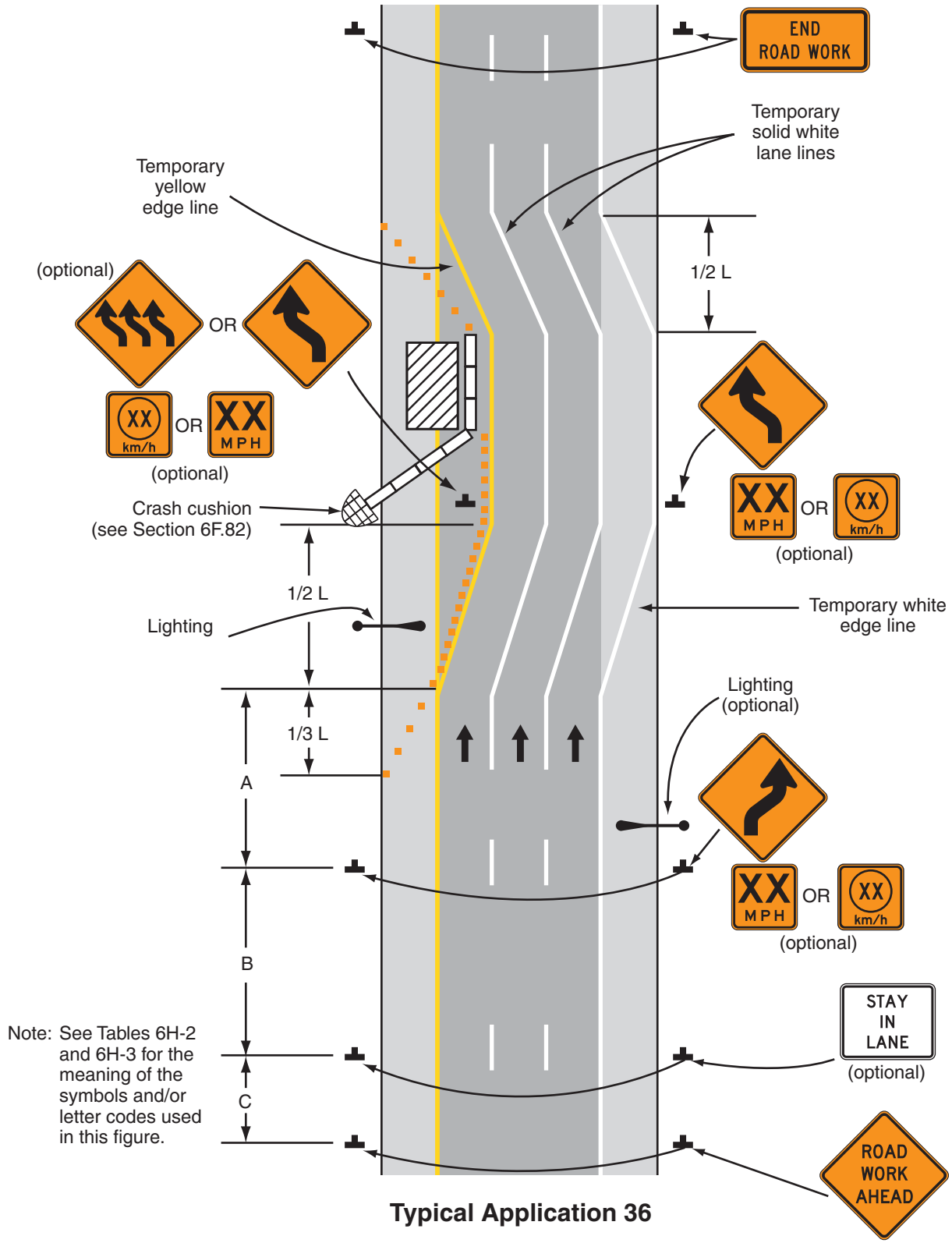
Guidance:

14. The use of a barrier should be based on engineering judgment.

Option:

15. 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.

Figure 6H-36. Lane Shift on Freeway (TA-36)



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

Typical Application 36

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

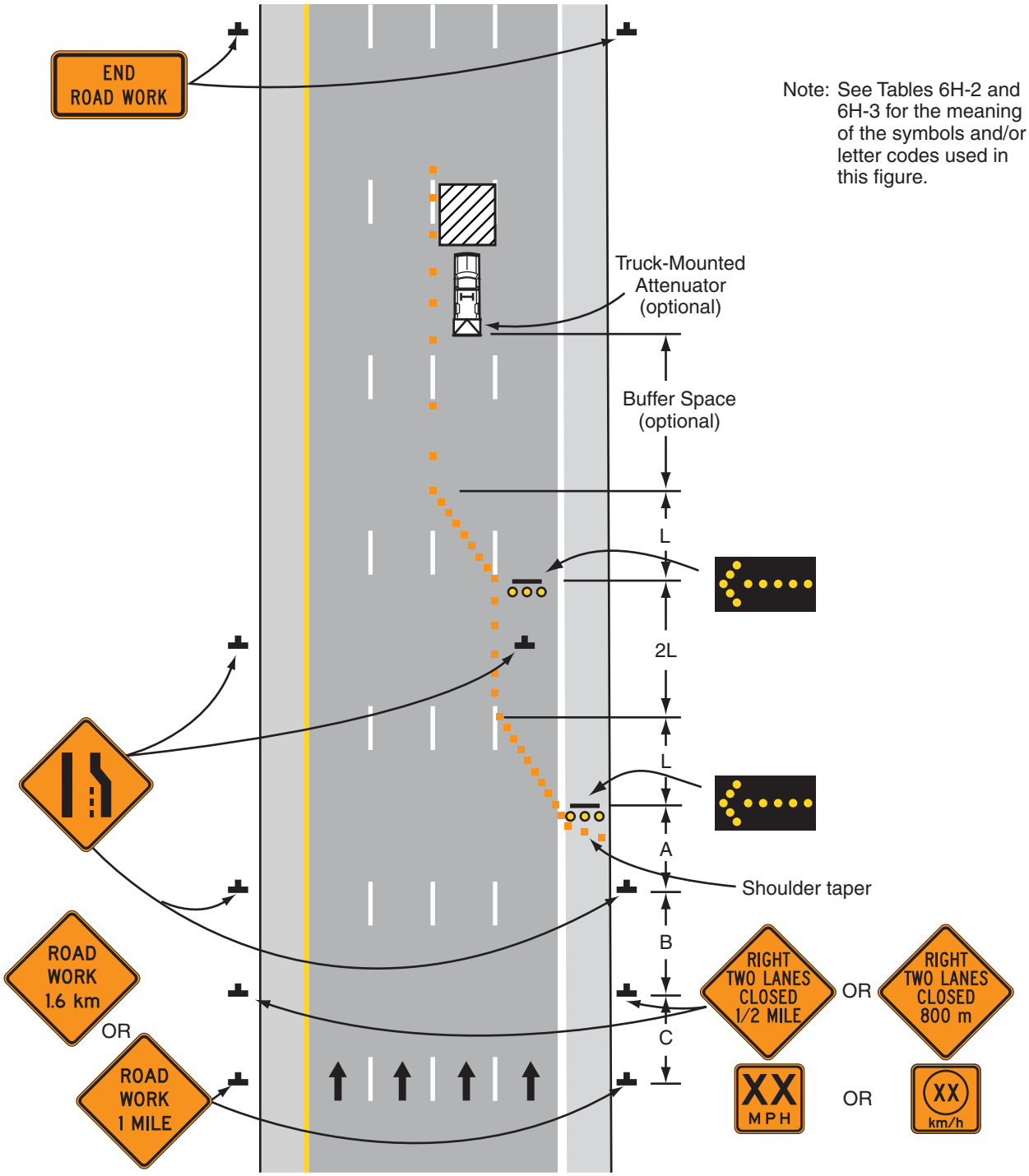
Guidance:

1. Ordinarily, the preferred position for the second arrow panel is in the closed exterior lane at the beginning of the second merging taper. However, the second arrow panel should be placed in the closed interior lane at the end of the second merging taper in the following situations:
   a. When a shadow vehicle is used in the interior closed lane, and the second arrow panel is mounted on the shadow vehicle;
   b. If alignment or other conditions create any confusion as to which lane is closed by the second arrow panel; and
   c. When the first arrow panel is placed in the closed exterior lane at the end of the first merging taper (the alternative position when the shoulder is narrow).

Option:

2. Flashing warning lights and/or flags may be used to call attention to the initial warning signs.
3. A truck-mounted attenuator may be used on the shadow vehicle.
4. If a paved shoulder having a minimum width of 3 m (10 ft) and sufficient strength is available, the left and adjacent interior lanes may be closed and vehicular traffic carried around the work space on the right lane and a right shoulder.
5. When a shoulder lane is used that cannot adequately accommodate trucks, trucks may be directed to use the normal travel lanes.

Figure 6H-37. Double Lane Closure on Freeway (TA-37)



Typical Application 37

Notes for Figure 6H-38—Typical Application 38
Interior Lane Closure on Freeway

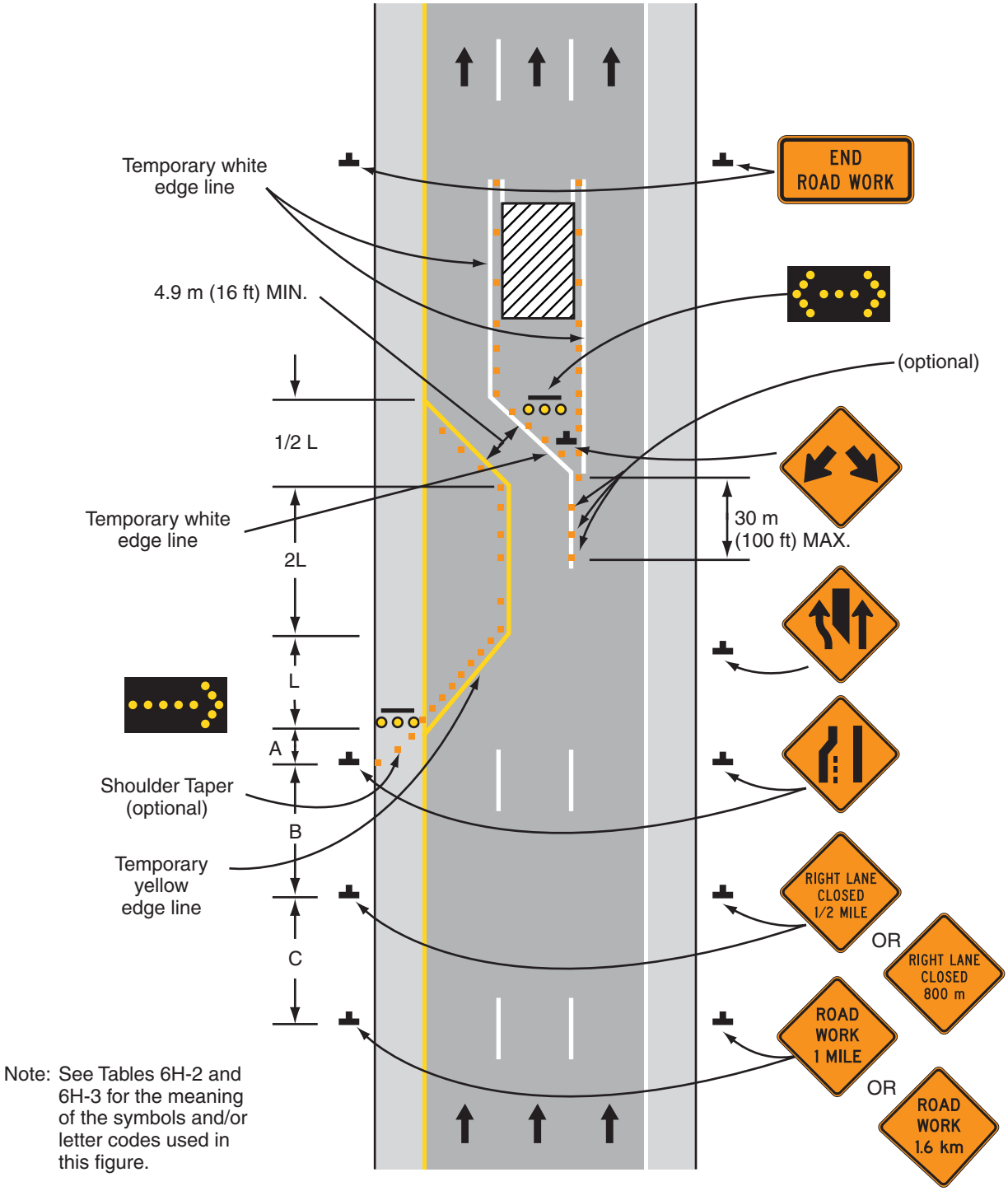
Guidance:

1. For a long-term closure, a barrier should be used to provide additional safety to the operation in the closed interior lane. A buffer space should be used at the upstream end of the closed interior lane.
2. The first arrow panel displaying a right arrow should be on the left shoulder at the beginning of the taper. The arrow panel displaying a double arrow should be centered in the closed interior lane and placed at the downstream end of the shifting taper.
3. The placement of signs should not obstruct or obscure arrow panels.
4. For long-term use, the dashed lane lines should be made solid white in the two-lane section.

Option:

5. As the arrow panel with a double arrow displayed is key, the arrow panel closing the exterior lane may be moved or omitted if the alignment is such that the two panels create confusion.
6. As an alternative to initially closing the left lane, as shown in the typical application, the right lane may be closed in advance of the interior lane closure with appropriate channelization and signs.
7. A short, single row of channelizing devices in advance of the vehicular traffic split to restrict vehicular traffic to their respective lanes may be added.
8. DO NOT PASS signs may be used.
9. If a paved shoulder having a minimum width of 3 m (10 ft) and sufficient strength is available, the left and center lanes may be closed and motor vehicle traffic carried around the work space on the right lane and a right shoulder.
10. When a shoulder lane is used that cannot adequately accommodate trucks, trucks may be directed to use the normal travel lanes.

Figure 6H-38. Interior Lane Closure on Freeway (TA-38)



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

Typical Application 38

Notes for Figure 6H-39—Typical Application 39
Median Crossover on Freeway

Standard:

1. **Channelizing devices or temporary traffic barriers shall be used to separate opposing vehicular traffic.**

Guidance:

2. For long-term work on high-speed, high-volume highways, consideration should be given to using a temporary traffic barrier to separate opposing vehicular traffic.

Option:

3. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic, DO NOT PASS, KEEP RIGHT, and DO NOT ENTER signs may be eliminated.
4. The alignment of the crossover may be designed as a reverse curve.

Guidance:

5. When the crossover follows a curved alignment, the design criteria contained in the AASHTO "Policy on the Geometric Design of Highways and Streets" should be used (see Section 1A.11).
6. When channelizing devices have the potential of leading vehicular traffic out of the intended traffic space, the channelizing devices should be extended a distance in meters (feet) of 0.4 times the speed limit in km/h (2 times the speed limit in mph) beyond the end of the transition area as depicted.
7. Where channelizing devices are used, the Two-Way Traffic signs should be repeated every 1.6 km (1 mi).

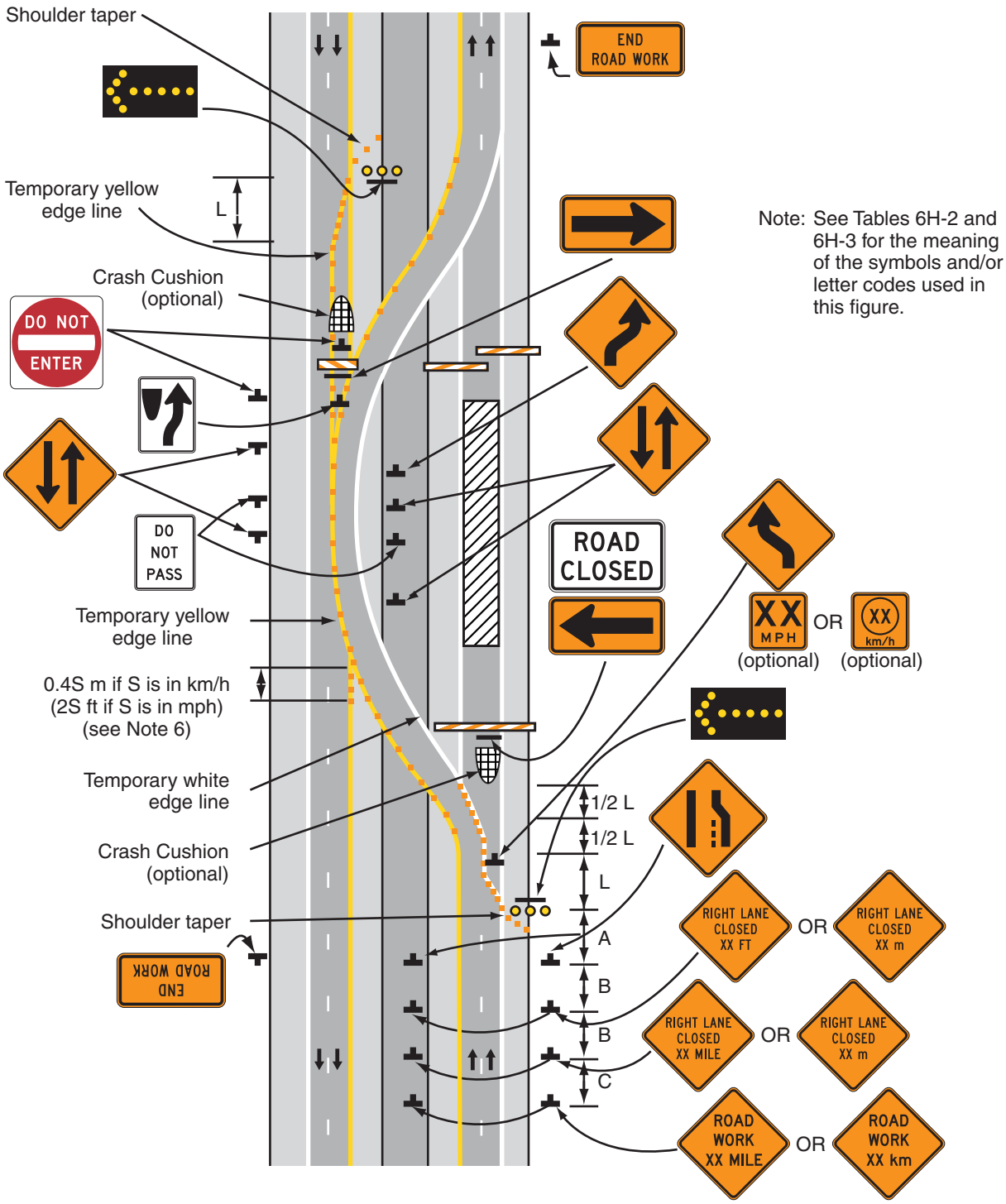
Option:

8. NEXT X km (MILES) Supplemental Distance plaques may be used with the Two-Way Traffic signs, where X is the distance to the end of the two-way section.

Support:

9. When the distance is sufficiently short that road users entering the section can see the far end of the section, they are less likely to forget that there is opposing vehicular traffic.
10. The sign legends for the four pairs of signs approaching the lane closure for the noncrossover direction of travel are not shown. They are similar to the series shown for the crossover direction, except that the left lane is closed.

Figure 6H-39. Median Crossover on Freeway (TA-39)



Typical Application 39

Notes for Figure 6H-40—Typical Application 40
Median Crossover for Entrance Ramp

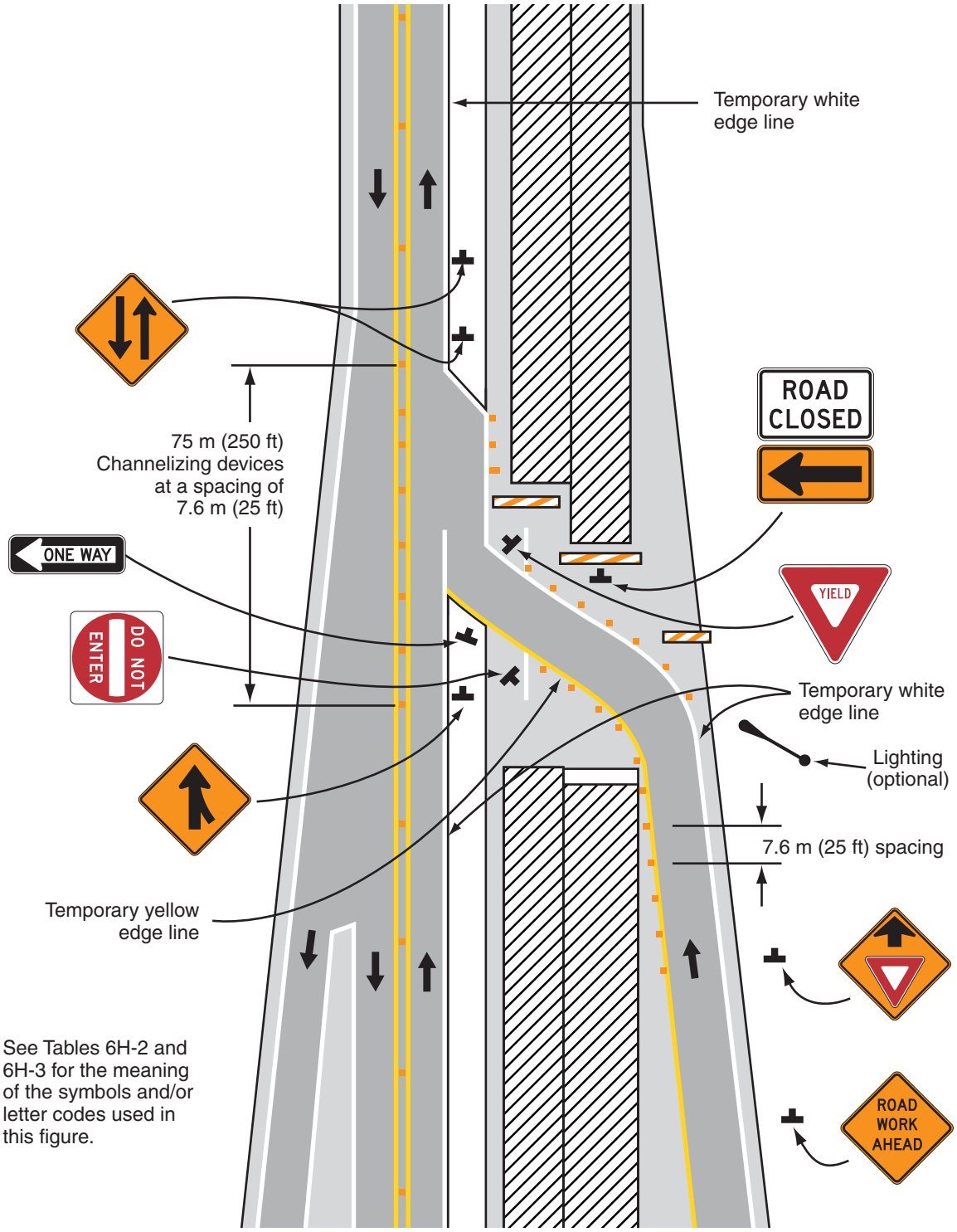
Guidance:

1. The typical application illustrated should be used for carrying an entrance ramp across a closed directional roadway of a divided highway.
2. A temporary acceleration lane should be used to facilitate merging.
3. When used, the YIELD or STOP sign should be located far enough forward to provide adequate sight distance of oncoming mainline vehicular traffic to select a reasonably safe gap. If needed, YIELD or STOP lines should be installed across the ramp to indicate the point at which road users should YIELD or STOP. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed.

Option:

4. If vehicular traffic conditions allow, the ramp may be closed.
5. A broken edge line may be carried across the temporary entrance ramp to assist in defining the through vehicular traffic lane.
6. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs and the DO NOT ENTER signs may be eliminated.

Figure 6H-40. Median Crossover for Entrance Ramp (TA-40)



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

Typical Application 40

Notes for Figure 6H-41—Typical Application 41
Median Crossover for Exit Ramp

Guidance:

1. This typical application should be used for carrying an exit ramp across a closed directional roadway of a divided highway. The design criteria contained in the AASHTO "Policy on the Geometric Design of Highways and Streets" (see Section 1A.11) should be used for determining the curved alignment.
2. The guide signs should indicate that the ramp is open, and where the temporary ramp is located. Conversely, if the ramp is closed, guide signs should indicate that the ramp is closed.
3. When the exit is closed, a black on orange EXIT CLOSED panel should be placed diagonally across the interchange/intersection guide signs.
4. In the situation (not shown) where channelizing devices are placed along the mainline roadway, the devices' spacing should be reduced in the vicinity of the off ramp to emphasize the opening at the ramp itself. Channelizing devices and/or temporary pavement markings should be placed on both sides of the temporary ramp where it crosses the median and the closed roadway.
5. Advance guide signs providing information related to the temporary exit should be relocated or duplicated adjacent to the temporary roadway.

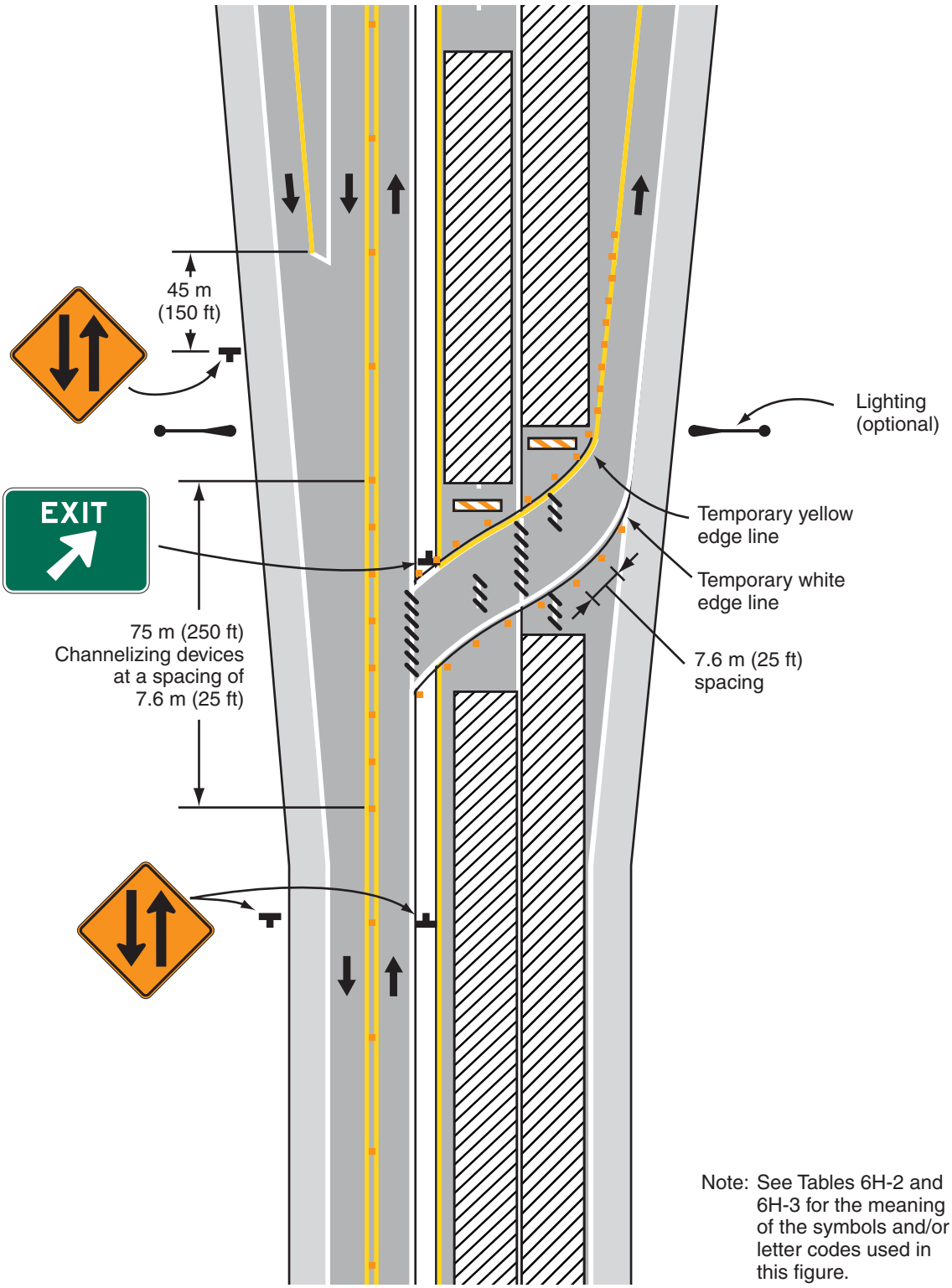
Standard:

6. **A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 2.1 m (7 ft) from the pavement surface to the bottom of the sign.**

Option:

7. Guide signs referring to the exit may need to be relocated to the median.
8. The temporary EXIT sign placed in the temporary gore may be either black on orange or white on green.
9. In some instances, a temporary deceleration lane may be useful in facilitating the exiting maneuver.
10. When a temporary traffic barrier is used to separate opposing vehicular traffic, the Two-Way Traffic signs may be omitted.

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



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

Typical Application 41

Notes for Figure 6H-42—Typical Application 42
Work in Vicinity of Exit Ramp

Guidance:

1. The guide signs should indicate that the ramp is open, and where the temporary ramp is located. However, if the ramp is closed, guide signs should indicate that the ramp is closed.
2. When the exit ramp is closed, a black on orange EXIT CLOSED panel should be placed diagonally across the interchange/intersection guide signs.
3. The design criteria contained in the AASHTO "Policy on the Geometric Design of Highways and Streets" should be used for determining the alignment (see Section 1A.11).

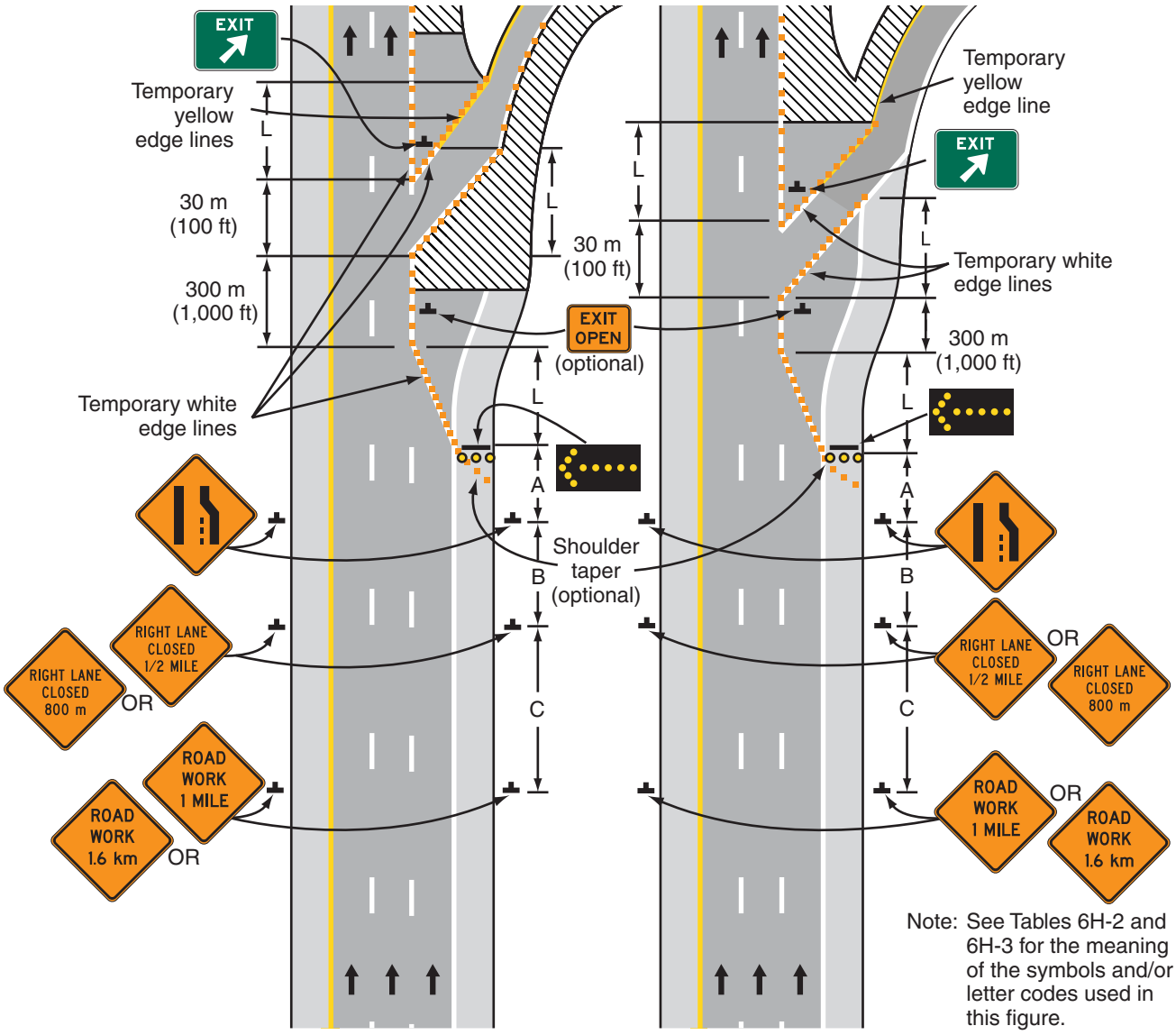
Standard:

4. **A temporary EXIT sign shall be located in the temporary gore. For better visibility, it shall be mounted a minimum of 2.1 m (7 ft) from the pavement surface to the bottom of the sign.**

Option:

5. An alternative procedure that may be used is to channelize exiting vehicular traffic onto the right shoulder and close the lane as necessary.

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



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

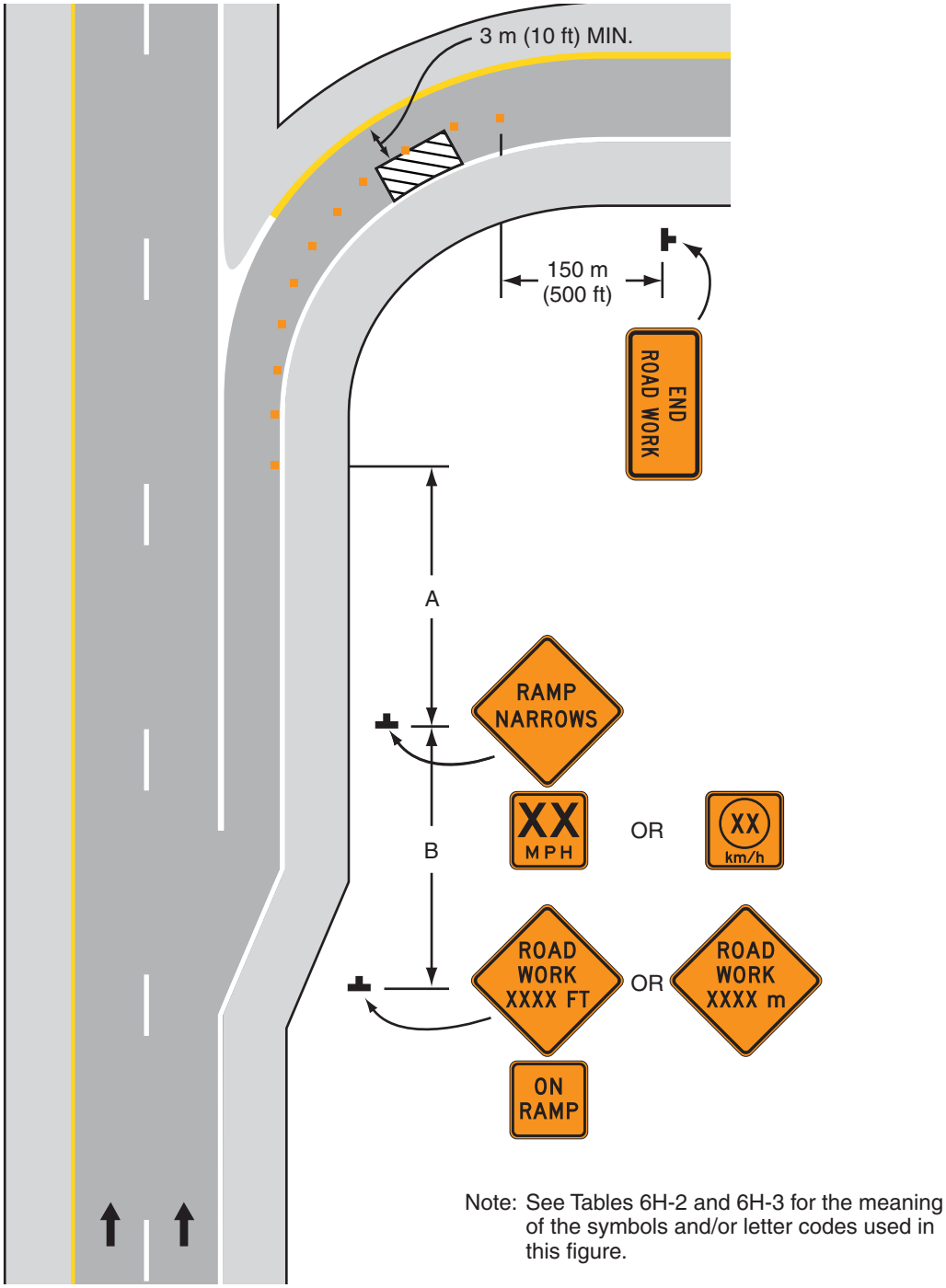
Typical Application 42

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

Guidance:

1. Truck off-tracking should be considered when determining whether the minimum lane width of 3 m (10 ft) is adequate (see Section 6G.07).

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



Typical Application 43

Notes for Figure 6H-44—Typical Application 44
Work in Vicinity of Entrance Ramp

Guidance:

1. An acceleration lane of sufficient length should be provided whenever possible as shown on the left diagram.

Standard:

2. **For the information shown on the diagram on the right side of the typical application, where inadequate acceleration distance exists for the temporary entrance, the YIELD sign shall be replaced with STOP signs (one on each side of the approach).**

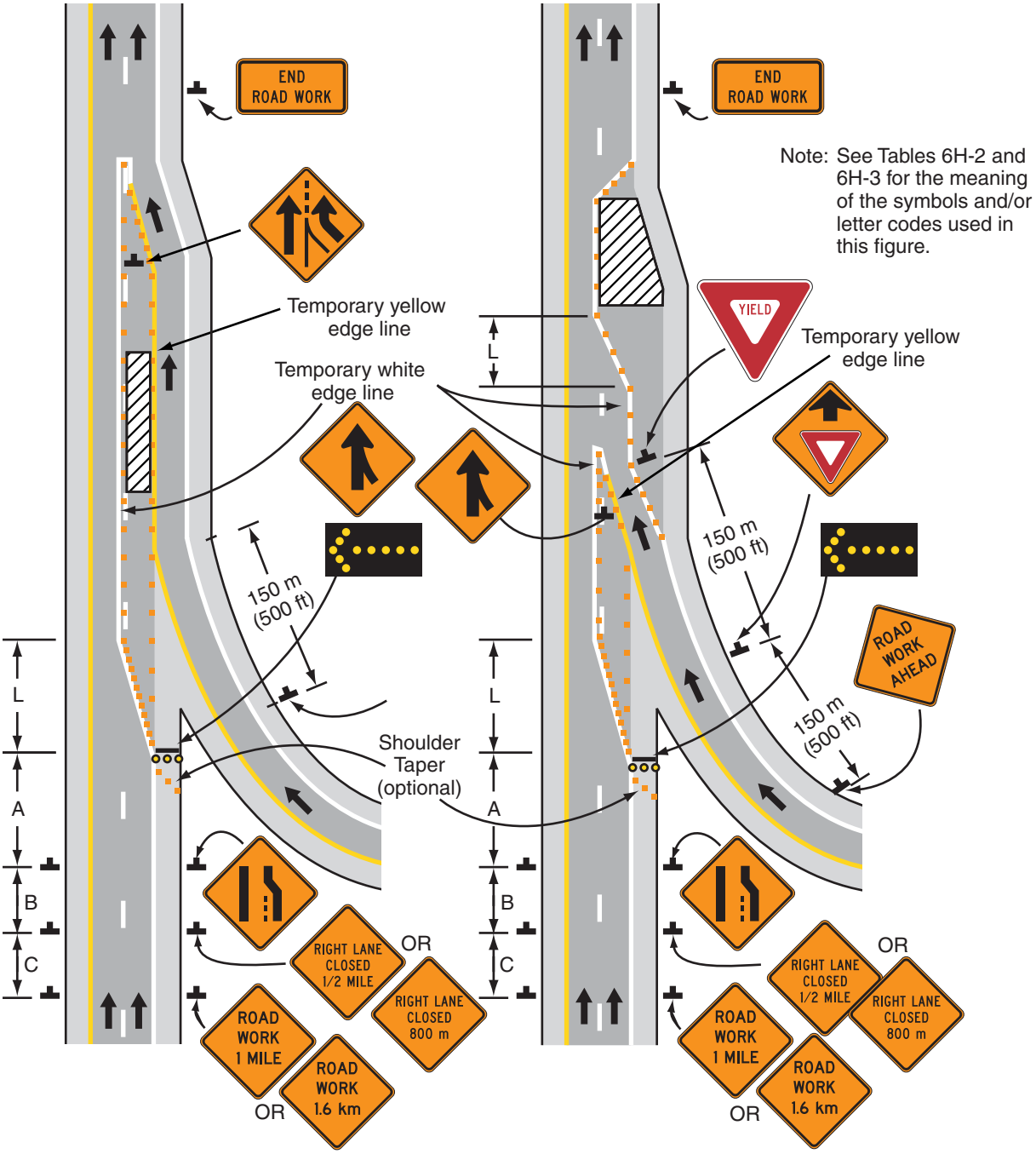
Guidance:

3. When used, the YIELD or STOP sign should be located so that ramp vehicular traffic has adequate sight distance of oncoming mainline vehicular traffic to select a reasonably safe gap in the mainline vehicular traffic flow. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed. If insufficient gaps are available, consideration should be given to closing the ramp.
4. Where STOP signs are used, a temporary stop line should be placed across the ramp at the desired stop location.
5. The mainline merging taper with the arrow panel at its starting point should be located sufficiently in advance so that the arrow panel is not confusing to drivers on the entrance ramp, and so that the mainline merging vehicular traffic from the lane closure has the opportunity to stabilize before encountering the vehicular traffic merging from the ramp.
6. If the ramp curves sharply to the right, warning signs with Advisory Speed Limits located in advance of the entrance terminal should be placed in pairs (one on each side of the ramp).

Option:

7. A Type B high-intensity warning flasher with a red lens may be placed above the STOP sign.
8. Where the acceleration distance is significantly reduced, a supplemental plaque may be placed below the YIELD AHEAD sign reading NO MERGE AREA.

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



Typical Application 44

Notes for Figure 6H-45—Typical Application 45
Temporary Reversible Lane Using Movable Barriers

Support:

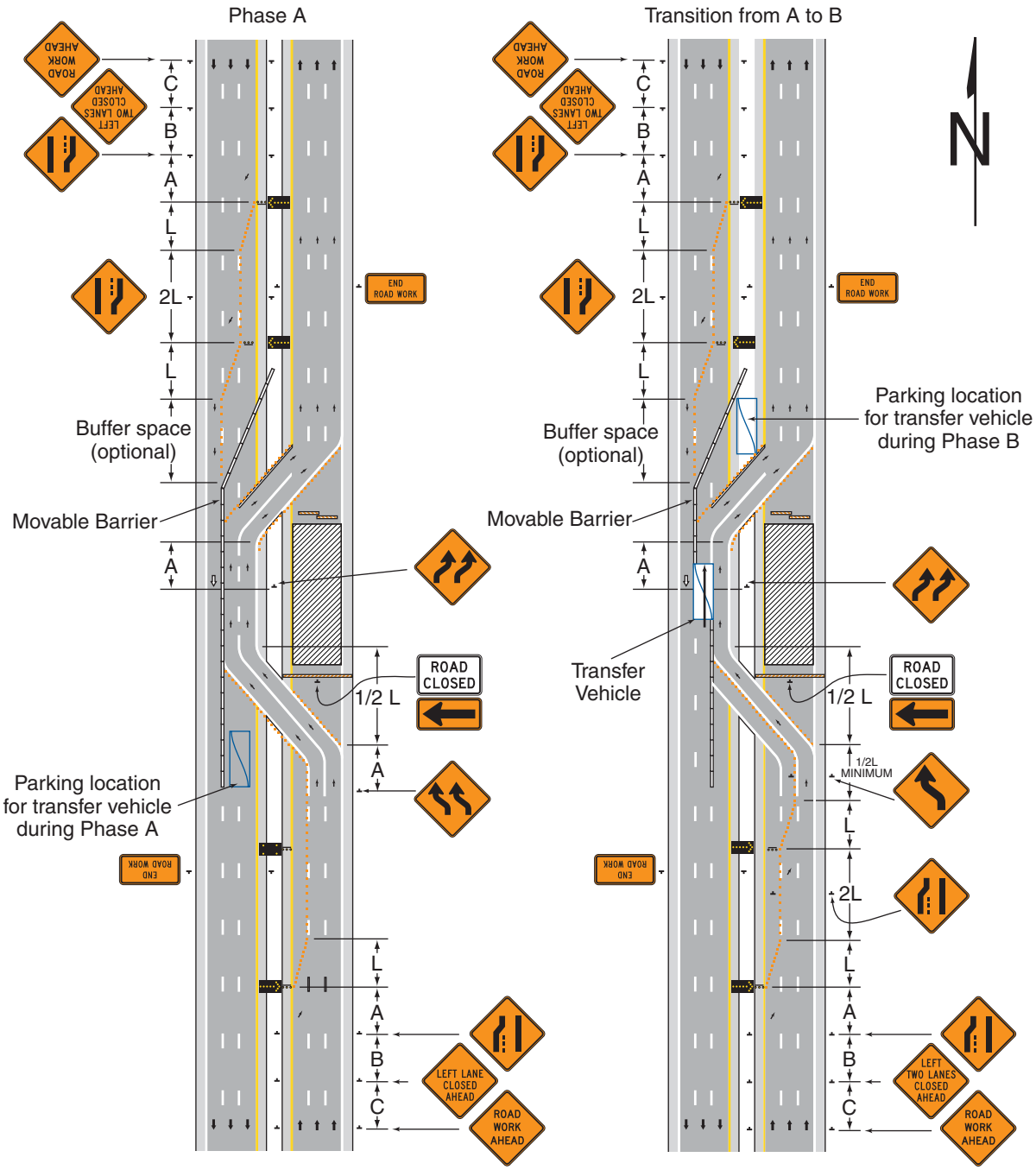
1. This application addresses one of several uses for movable barriers in highway work zones. In this example, one side of a 6-lane divided highway is closed to perform the work operation, and vehicular traffic is carried in both directions on the remaining 3-lane roadway by means of a median crossover. To accommodate unbalanced peak-period vehicular traffic volumes, the direction of travel in the center lane is switched to the direction having the greater volume, with the transfer typically being made twice daily. Thus, there are four vehicular traffic phases described as follows:
   a. Phase A—two travel lanes northbound and one lane southbound;
   b. Transition A to B—one travel lane in each direction;
   c. Phase B—one travel lane northbound and two lanes southbound; and
   d. Transition B to A—one travel lane in each direction.

   The typical application on the left illustrates the placement of devices during Phase A. The typical application on the right shows conditions during the transition (Transition A to B) from Phase A to Phase B.

Guidance:

2. For the reversible-lane situation depicted, the ends of the movable barrier should terminate in a protected area or a crash cushion should be provided. During Phase A, the transfer vehicle should be parked behind the end of the movable barrier. During Phase B, the transfer vehicle should be parked behind the end of the movable barrier.
   The transition shift from Phase A to B should be as follows:
   a. Change the signs in the northbound advance warning area and transition area from a LEFT LANE CLOSED AHEAD to a LEFT TWO LANES CLOSED AHEAD. Change the mode of the second northbound arrow panel from Caution to Right Arrow.
   b. Place channelizing devices to close the northbound center lane.
   c. Move the transfer vehicle from south to north to shift the movable barrier from the west side to the east side of the reversible lane.
   d. Remove the channelizing devices closing the southbound center lane.
   e. Change the signs in the southbound transition area and advance warning area from a LEFT TWO LANES CLOSED AHEAD to LEFT LANE CLOSED AHEAD. Change the mode of the second southbound arrow panel from Right Arrow to Caution.
3. Where the lane to be opened and closed is an exterior lane (adjacent to the edge of the traveled way or the work space), the lane closure should begin by closing the lane with channelizing devices placed along a merging taper using the same information employed for a stationary lane closure. The lane closure should then be extended with the movable-barrier transfer vehicle moving with vehicular traffic. When opening the lane, the transfer vehicle should travel against vehicular traffic. The merging taper should be removed in a method similar to a stationary lane closure.

Figure 6H-45. Movable Barriers (TA-45)



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

Notes for Figure 6H-46—Typical Application 46
Work in Vicinity of Highway-Rail Grade Crossing

Guidance:

1. When highway-rail grade crossings exist either within or in the vicinity of roadway work activities, extra care should be taken to minimize the probability of conditions being created, either by lane restrictions, flagging or other operations, where vehicles might be stopped within the highway-rail grade crossing, considered as being 4.6 m (15 ft) on either side of the closest and farthest rail.

Standard:

2. **If the queuing of vehicles across active rail tracks cannot be avoided, a uniformed law enforcement officer or flagger shall be provided at the highway-rail grade crossing to prevent vehicles from stopping within the highway-rail grade crossing (as described in Note 1), even if automatic warning devices are in place.**

Guidance:

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

Option:

6. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
7. A BE PREPARED TO STOP sign may be added to the sign series.

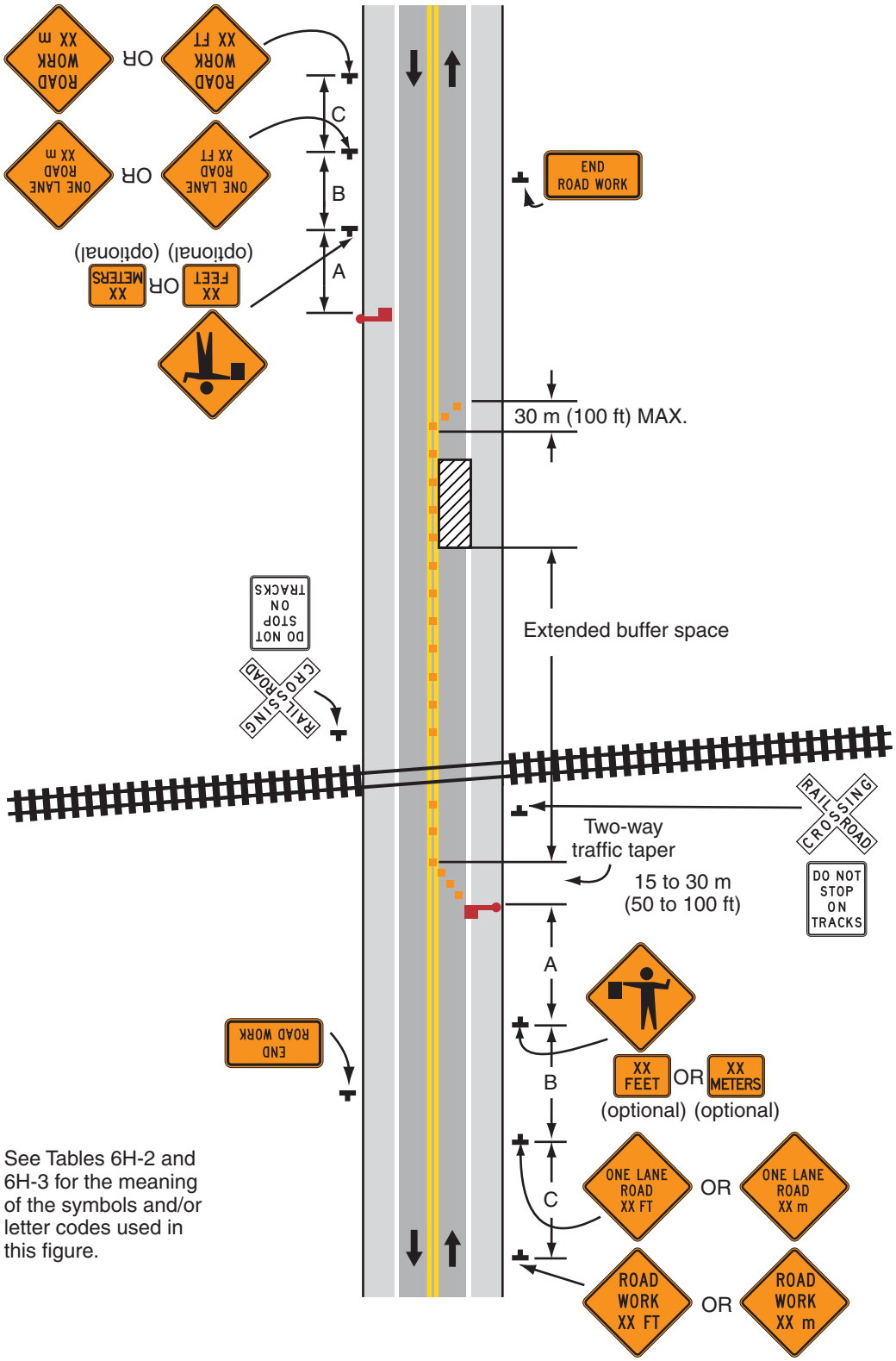
Guidance:

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

Standard:

9. **At night, flagger stations shall be illuminated, except in emergencies.**

Figure 6H-46. Work in Vicinity of Highway-Rail Grade-Crossing (TA-46)



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

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