

**Table 6B-1. Recommended Advance
Warning Sign Minimum Spacing**

Road Type	Distance between Signs**		
	A	B	C
Urban (low speed) * 25 mph or less***	100 feet	100 feet	100 feet
Urban – 30 mph***	150 feet	150 feet	150 feet
Urban – 35 mph***	200 feet	200 feet	200 feet
Urban – 40 mph***	250 feet	250 feet	250 feet
Urban – 45 mph***	300 feet	300 feet	300 feet
Urban (high speed) * 50 mph or more***	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2,640 feet

* ~~Speed category to be determined by the highway agency or owner of site roadways open to public travel.~~

** The column headings A, B, and C are the dimensions shown in Figures 6P-1 through 6P-54**** 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 "first sign" is the sign in a three-sign series that is closest to the TTC zone. The "third sign" is the sign that is furthest upstream from the TTC zone.)

*** Posted speed limit, off-peak 85th – percentile speed prior to work starting, or other anticipated operating speed in mph.

**** Refer to FHWA's List of Known Errors for error in **. Refer to Section 1A.04 for more details.

Table 6B-2. Stopping Sight Distance as a Function of Speed on Level Roads
(Used as suggested longitudinal buffer space length or location for flagger station)

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

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

Table 6B-2(CA). Stopping Sight Distance as a Function of Speed on Downgrades
(Used as suggested longitudinal buffer space length or location for flagger station)

Speed (mph)	% Downgrade (Buffer Space)		
	- 3% (feet)	- 6% (feet)	- 9% (feet)
20	116	120	126
25	158	165	173
30	205	215	227
35	257	271	287
40	315	333	354
45	378	400	427
50	446	474	507
55	520	553	593
60	598	638	686
65	682	728	785
70	771	825	891
75	866	927	1003

*Exhibit 3-2. A Policy on Geometric Design on Highways and Streets, AASHTO, 2001, p.115

Table 6B-3. Taper Length Criteria for Temporary Traffic Control Zones

Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet minimum, 100 feet maximum
Downstream Taper	50 feet minimum, 100 feet maximum

Note: Use Table 6B-4 to calculate L

**Table 6B-3(CA). Taper Length Criteria for Temporary Traffic Control Zones
(for 12 feet Offset Width)**

Speed S (mph)	Minimum Taper Length** For Width of Offset 12 feet (W)			
	Merging L (feet)	Shifting L/2 (feet)	Shoulder L/3 (feet)	Down Stream (feet)***
20	80	40	27	50
25	125	63	42	50
30	180	90	60	50
35	245	123	82	50
40	320	160	107	50
45	540	270	180	50
50	600	300	200	50
55	660	330	220	50
60	720	360	240	50
65	780	390	260	50
70	840	420	280	50
75	900	450	300	50

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

** - For other offsets use the following merging taper length formula for L:

For speeds of 40 mph or less, $L = WS^2/60$

For speeds of 45 mph or more, $L = WS$

Where: L = taper length in feet

W = width of offset in feet

S = posted speed limit, off-peak 85th -percentile speed prior to work starting, or the anticipated operating speed in mph.

***-Maximum downstream taper in length is 100 feet. Refer to Section 6B.08.

**Table 6B-4. Formulas for Determining
Taper Length**

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

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

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

Guidance:

1. A **SHOULDER WORK (W21-5)** sign should be placed on the left-hand side of the roadway for a divided or one-way street only if the left-hand shoulder is affected.

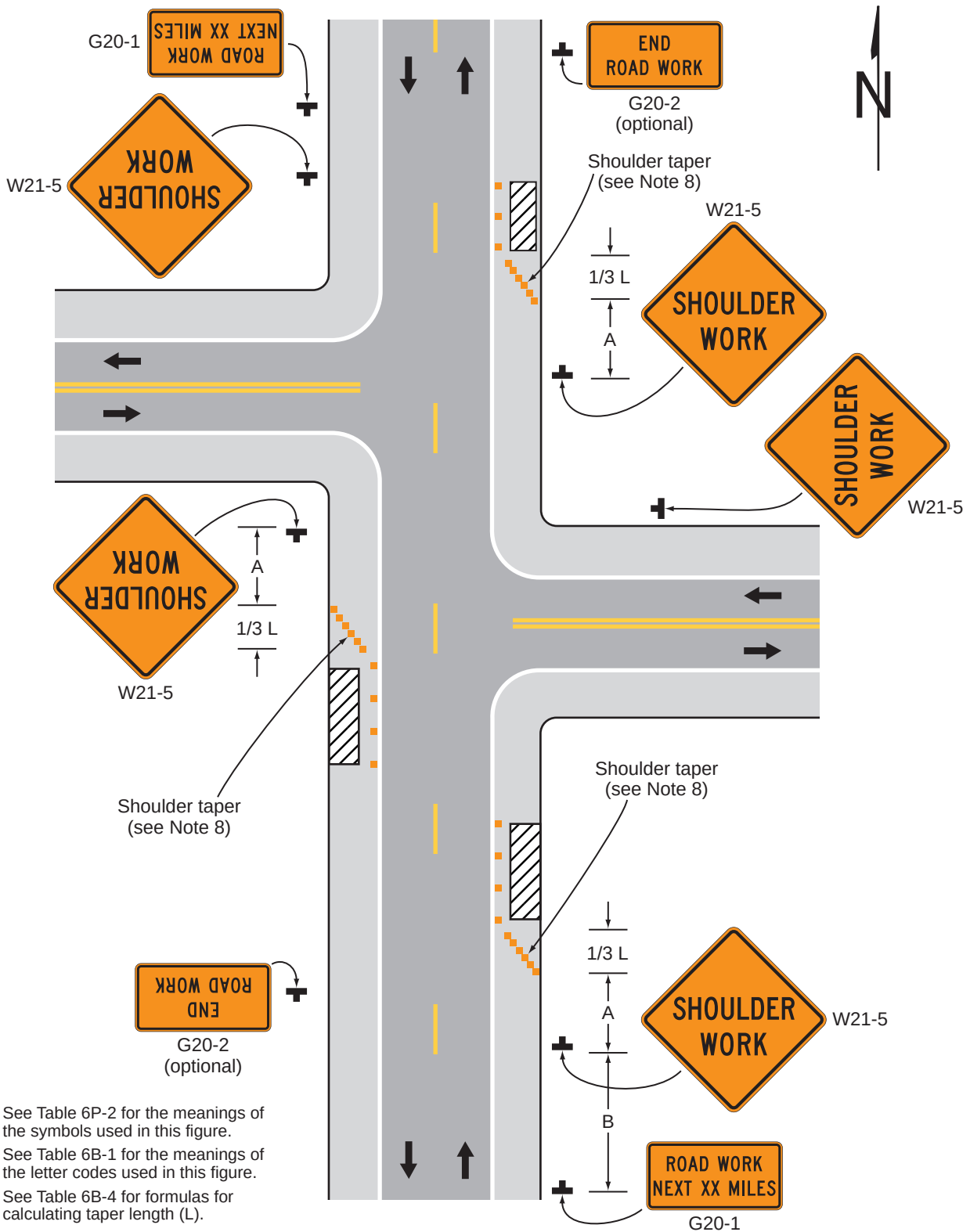
Option:

2. Positive protection devices may be used per Section 6M.02.
3. The Workers symbol signs may be used instead of SHOULDER WORK (W21-5) signs.
4. The SHOULDER WORK (W21-5) 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.
5. 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.
6. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

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

Figure 6P-3. Work on the Shoulders (TA-3)



Typical Application 3

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

Guidance:

1. *In those situations where multiple work locations within a limited distance make it practicable to place stationary signs, the distance between the advance warning sign and the work should not exceed 5 miles.*
2. *In those situations where the distance between the advance signs and the work is 2 miles to 5 miles, a Supplemental Distance plaque should be used with the ROAD WORK AHEAD (W20-1) sign or SHOULDER WORK AHEAD (C24(CA)) sign.*

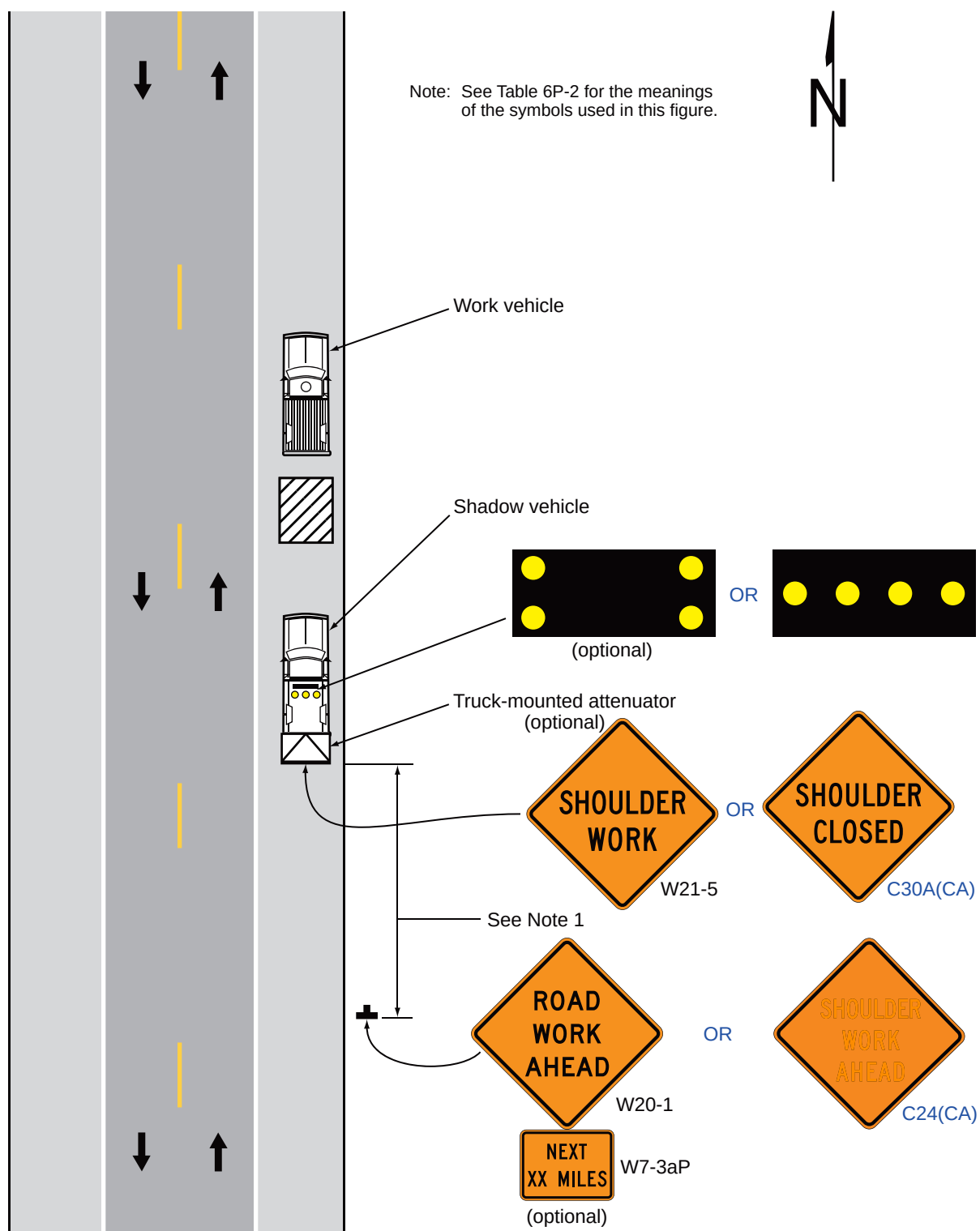
Option:

3. Additional positive protection devices may be used per Section 6M.02.
4. The ROAD WORK NEXT XX MILES sign may be used instead of the ROAD WORK AHEAD sign or SHOULDER WORK AHEAD (C24(CA)) sign if the work locations occur over a distance of more than 2 miles.
5. Stationary warning signs may be omitted for short duration or mobile operations if the work vehicle displays high-intensity rotating, flashing, oscillating, or strobe lights.
6. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:

7. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.**
8. **If an arrow board is used for an operation on the shoulder, the caution mode shall be used.**
9. **Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.**

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



Typical Application 4

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

Guidance:

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

Option:

3. Additional positive protection devices may be used per Section 6M.02.
4. For short-term use on low-volume, low-speed roadways with vehicular traffic that does not include longer and wider heavy commercial vehicles, a minimum lane width of 9 feet may be used.
5. Where the opposite shoulder is suitable for carrying vehicular traffic and of adequate width, lanes may be shifted by use of closely-spaced channelizing devices, provided that the minimum lane width of 10 feet is maintained.
6. Additional advance warning may be appropriate, such as a ROAD NARROWS (W5-1) sign.
7. Temporary traffic barriers may be used along the work space.
8. The shadow vehicle may be omitted if a taper and channelizing devices are used.
9. A truck-mounted attenuator may be used on the shadow vehicle.
10. 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.
11. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

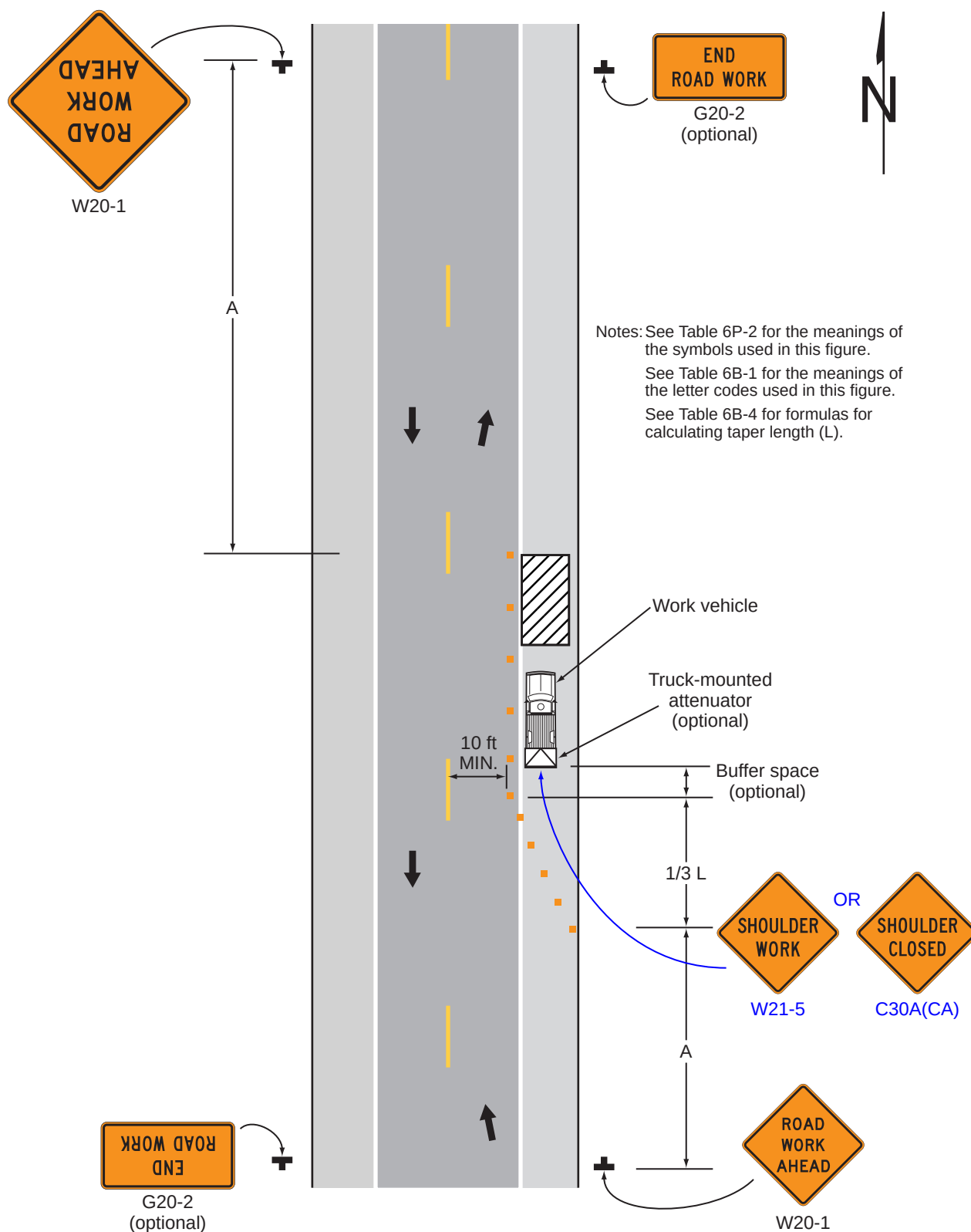
Standard:

12. 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.
13. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.
14. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights.

Guidance:

15. All advance warning signs should be placed so that the path of travel for bicycles is not blocked, while maintaining visibility for road users.
16. When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (refer to Section 6N.01) and the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, the Bicycle Warning (W11-1) sign and the IN ROAD (W16-1P) plaque should be used to advise motorists of the presence of bicyclists in the travel way lanes.
17. Except for short durations and mobile operations, when a highway shoulder is occupied and bicyclists would be sharing a lane with vehicular traffic, as a result of the TTC zone, speed reduction countermeasures should be used to reduce traffic speeds in the TTC zone. Refer to Sections 6B.01 and 6C.04.
18. Except for short durations and mobile operations, when a highway shoulder is occupied and bicyclists would be sharing a lane with vehicular traffic, as a result of the TTC zone, before narrowing the outside lane other measures such as widening the outside shoulder to allow bicyclists and motor vehicles to travel side by side through the TTC zone should be considered.
19. If traffic volumes make it feasible, the two left lanes should be merged into one lane to avoid using the shoulder as a traveled way lane and allowing continued use for emergency purposes and bicycle travel.
20. When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (refer to Section 6N.01) and the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, a separate path should be considered for bicyclists.

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



Typical Application 6

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

Option:

1. Positive protection devices may be used per Section 6M.02.
2. For low-volume situations with short TTC 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 6D).
3. The ROAD WORK AHEAD (W20-1) and the END ROAD WORK (G20-2) signs may be omitted for short-duration operations.
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A BE PREPARED TO STOP (W3-4) sign may be added to the sign series.
5. Automated Flagger Assistance Devices (see Section 6L.02) may be used in situations where there is only one lane of approaching traffic in the direction to be controlled.

Guidance:

6. *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:

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

Guidance:

8. *When used, the BE PREPARED TO STOP (W3-4) sign should be located ~~between~~ after the Flagger sign and the ONE LANE ROAD (W20-4) sign.*
9. *When a grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the grade crossing, the TTC zone should be extended so that the transition area precedes the grade crossing.*
10. *When a grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.*
11. *When a grade crossing exists within the activity area, drivers operating on the left-hand side of the normal center line should be provided with comparable warning devices as for drivers operating on the right-hand side of the normal center line.*
12. *Early coordination with the railroad company or transit agency should occur before work starts.*

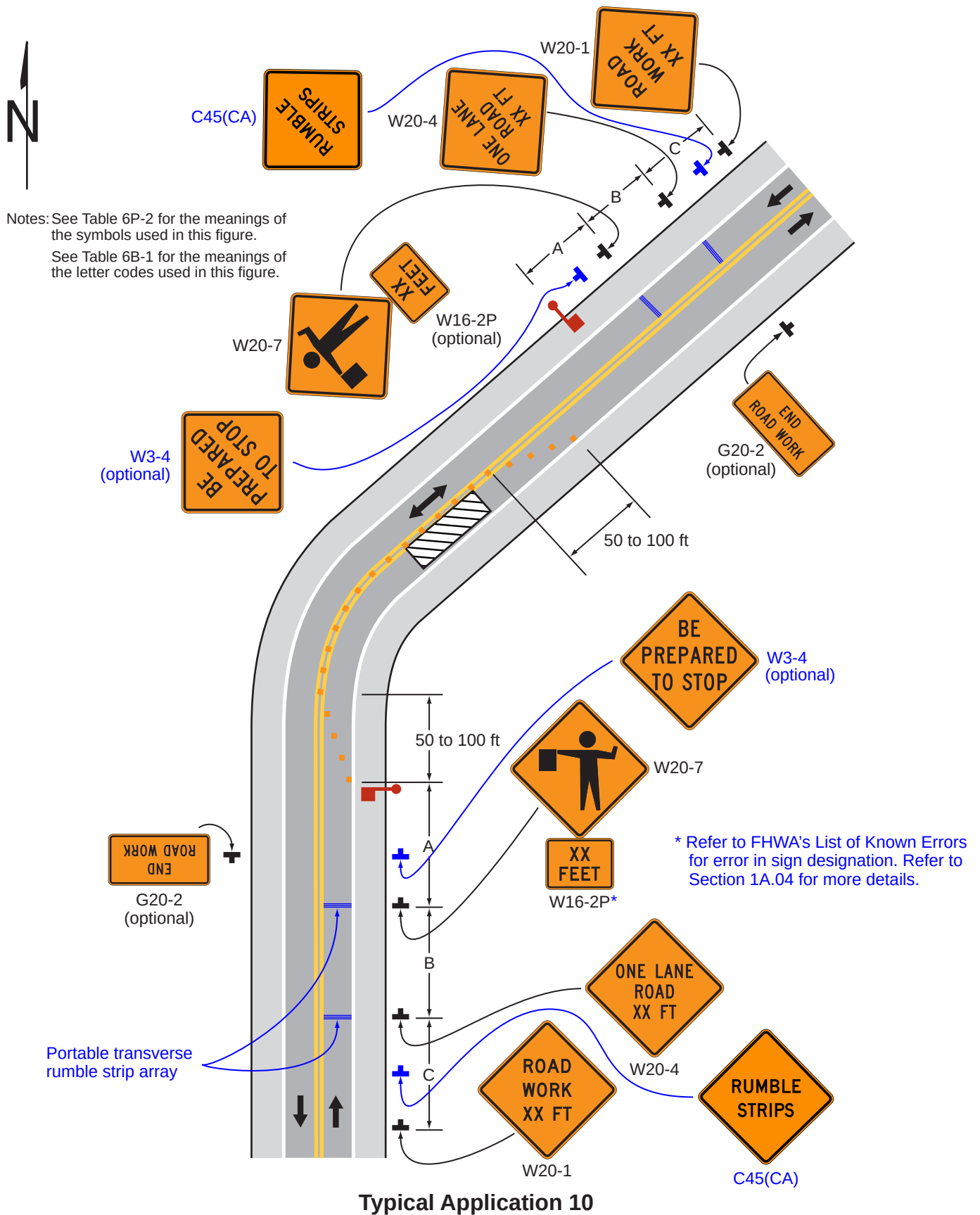
Option:

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

Support:

14. For State highways, refer to Caltrans' Standard Plan T13. Refer to Section 1A.05 for information regarding this publication.
15. If portable transverse rumble strips are used for flagging operations, refer to Section 6M.06.

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



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

Guidance:

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

Option:

2. Positive protection devices may be used per Section 6M.02.
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 9 feet may be used for short-term stationary work on low-volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.
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.

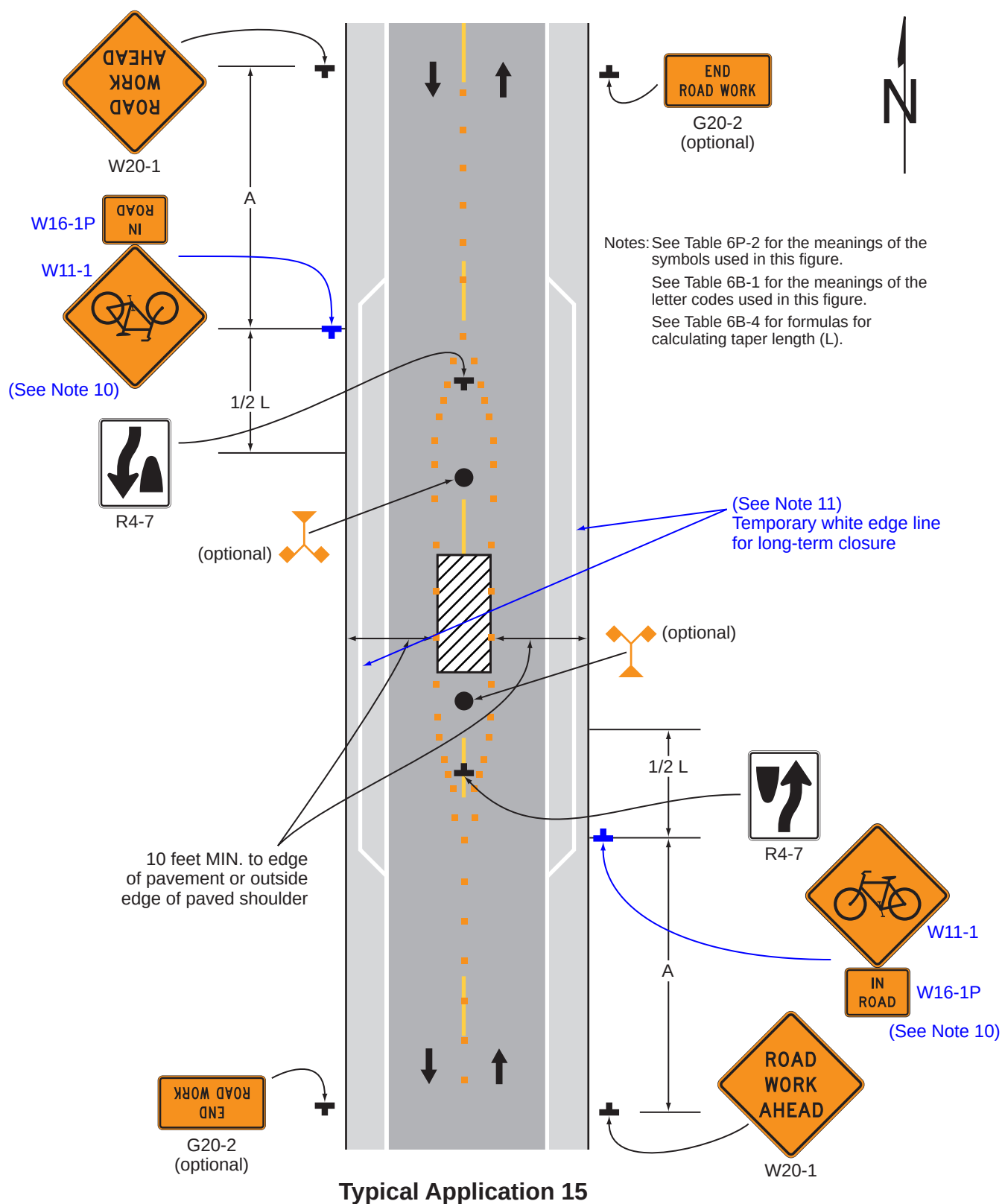
Standard:

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

Guidance:

9. *All advance warning signs should be placed so that the path of travel for bicycles is not blocked while maintaining visibility for road users.*
10. *When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (refer to Section 6N.01) and the roadway width is inadequate for allowing bicyclists and motor vehicles to travel side by side, the Bicycle Crossing (W11-1) sign and the IN ROAD (W16-1P) plaque should be used to advise motorists of the presence of bicyclists in the travel way lanes.*
11. *When existing accommodations for bicycle travel are disrupted or closed in a long-term duration project (refer to Section 6N.01), the temporary white edge line should be used on the shoulder to indicate the use of a portion of the shoulder as a traveled way lane.*

Notes: See Table 6P-2 for the meanings of the symbols used in this figure.
See Table 6B-1 for the meanings of the letter codes used in this figure.
See Table 6B-4 for formulas for calculating taper length (L).



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

Standard:

1. When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility. A pedestrian channelizing device (see Figure 6K-2) that is detectable by a person with a vision disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
2. When used, temporary ramps shall provide a 12:1 (8.33%) or flatter slope, with a slip-resistant surface. The ramp landing area shall provide a 48-inch x 48-inch minimum area with a 2% or flatter cross-slope.
3. When used, Longitudinal Channelizing Devices used for temporary pedestrian routes shall comply with Section 6K.02.
4. Temporary traffic barriers, if used, shall comply with the provisions of Section 6M.02.
5. SIDEWALK CLOSED CROSS HERE signs shall include audible information devices to provide adequate communication to pedestrians with vision disabilities.
6. Audible information devices shall be provided where midblock sidewalk closings and changed crosswalk areas cause inadequate communication to be provided to pedestrians with vision disabilities.

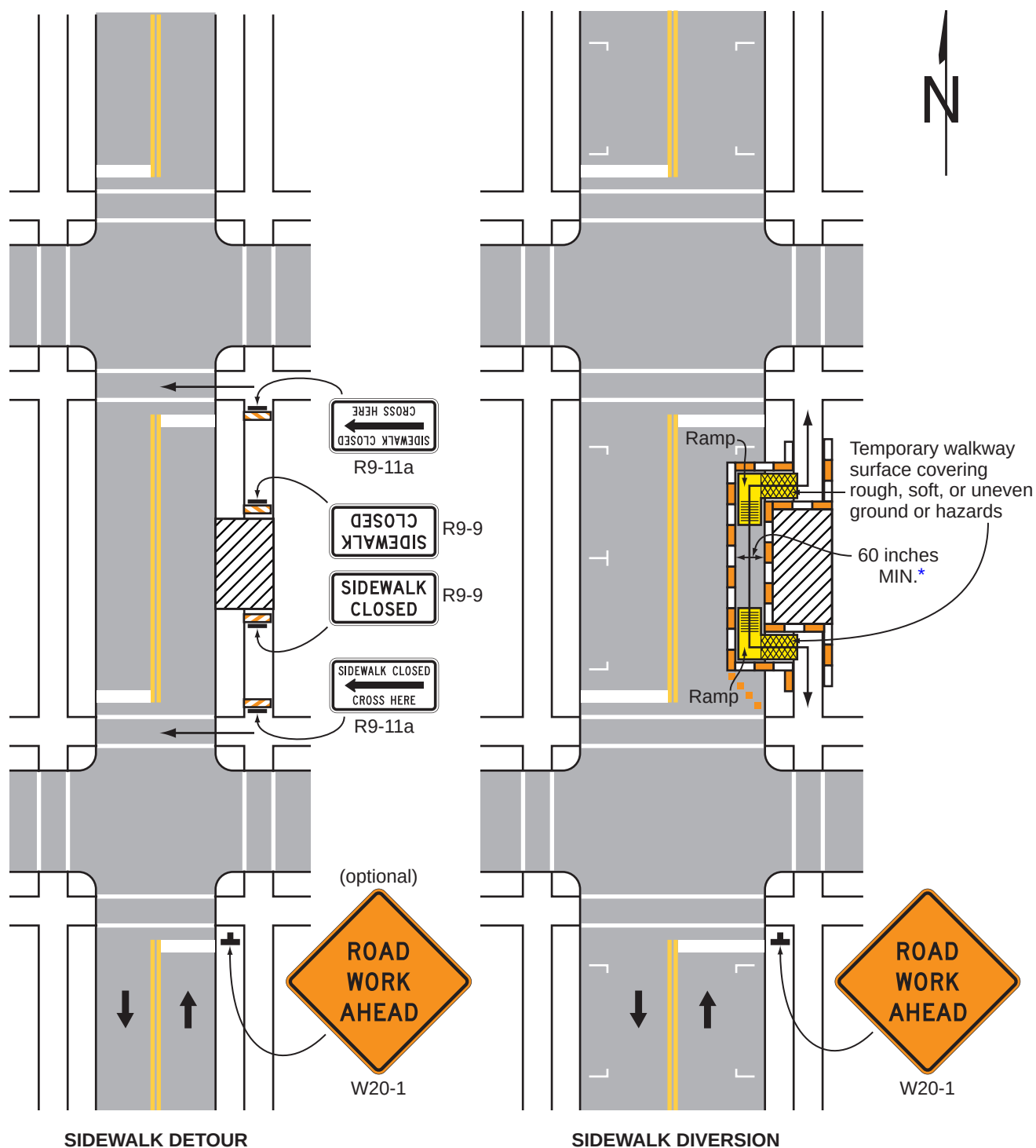
Guidance:

7. The surface of an alternate pathway should meet the requirements of the U.S. Department of Justice 2010 ADA Standards for Accessible Design, September 15, 2010, 28 CFR 35 and 36, Americans with Disabilities Act of 1990.
8. The protective requirements of a TTC situation have priority in determining the need for temporary traffic barriers and their use in this situation should be based on engineering judgment.

Option:

9. Street lighting may be considered.
10. Only the TTC devices related to pedestrians are shown. Other devices, such as lane closure signing or ROAD NARROWS (W5-1) signs, may be used to control vehicular traffic.
11. For nighttime closures, Type A Flashing warning lights may be used on barricades that support signs and close sidewalks.
12. 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.
13. Signs, such as KEEP RIGHT (LEFT) (R4-7a, R4-8a), may be placed along a temporary sidewalk to guide or direct pedestrians.
14. The width of the alternate pedestrian route may be 48 inches with a passing area of 60 inches every 200 feet.

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



Typical Application 28

Note: See Table 6P-2 for the meanings of the symbols used in this figure.

* Refer to FHWA's List of Known Errors for error in figure text. Refer to Section 1A.04 for more details.

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

Standard:

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

Guidance:

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

Option:

4. A truck-mounted attenuator may be used on the work vehicle and/or shadow vehicle.
5. Positive protection devices may be used per Section 6M.02. Support:
6. Where conditions permit, restricting all vehicles, equipment, workers, and their activities to one side of the roadway might be advantageous.

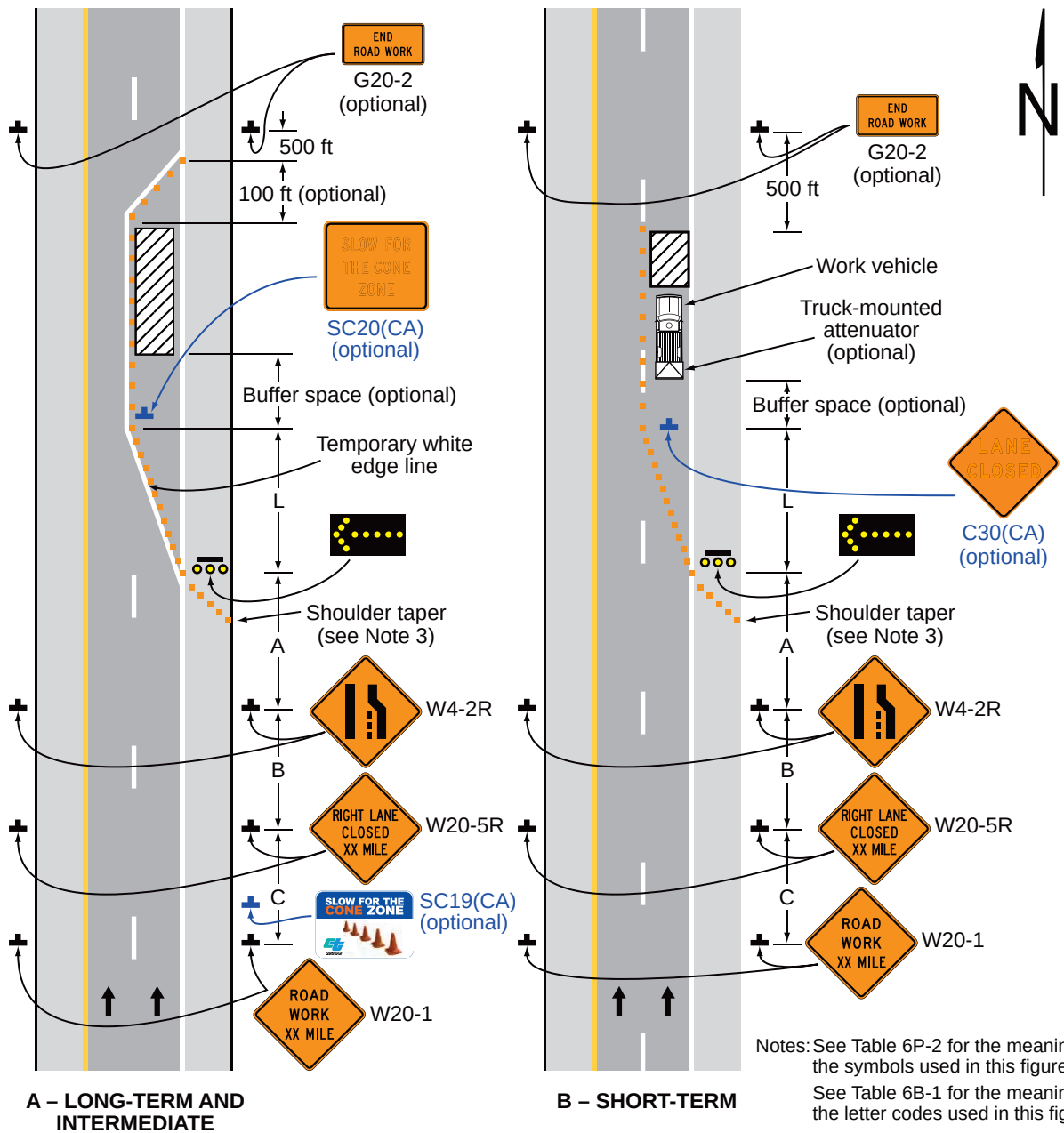
Standard:

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

Support:

8. Refer to Section 6F.102(CA) for use of the Slow For The Cone Zone (SC19(CA) and SC20(CA)) Signs.

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



Typical Application 33

Notes for Figure 6P-48 – Typical Application 48 Bicycle Lane Closure with an On-Road Detour

Guidance:

1. *A detour route for bicyclists where a section of bicycle lane is closed should use the most direct route practical on roadways or shoulders where conditions are appropriate for bicycling.*
2. *Bicycle related regulatory and/or warning signs should be considered along the bicycle detour based on engineering judgment and traffic conditions.*
3. *A Street Name sign or Bike Route Name sign should be mounted with the Bike Detour sign.*

Option:

4. The Street Name sign or Bike Route Name sign may be either white on green or black on orange.

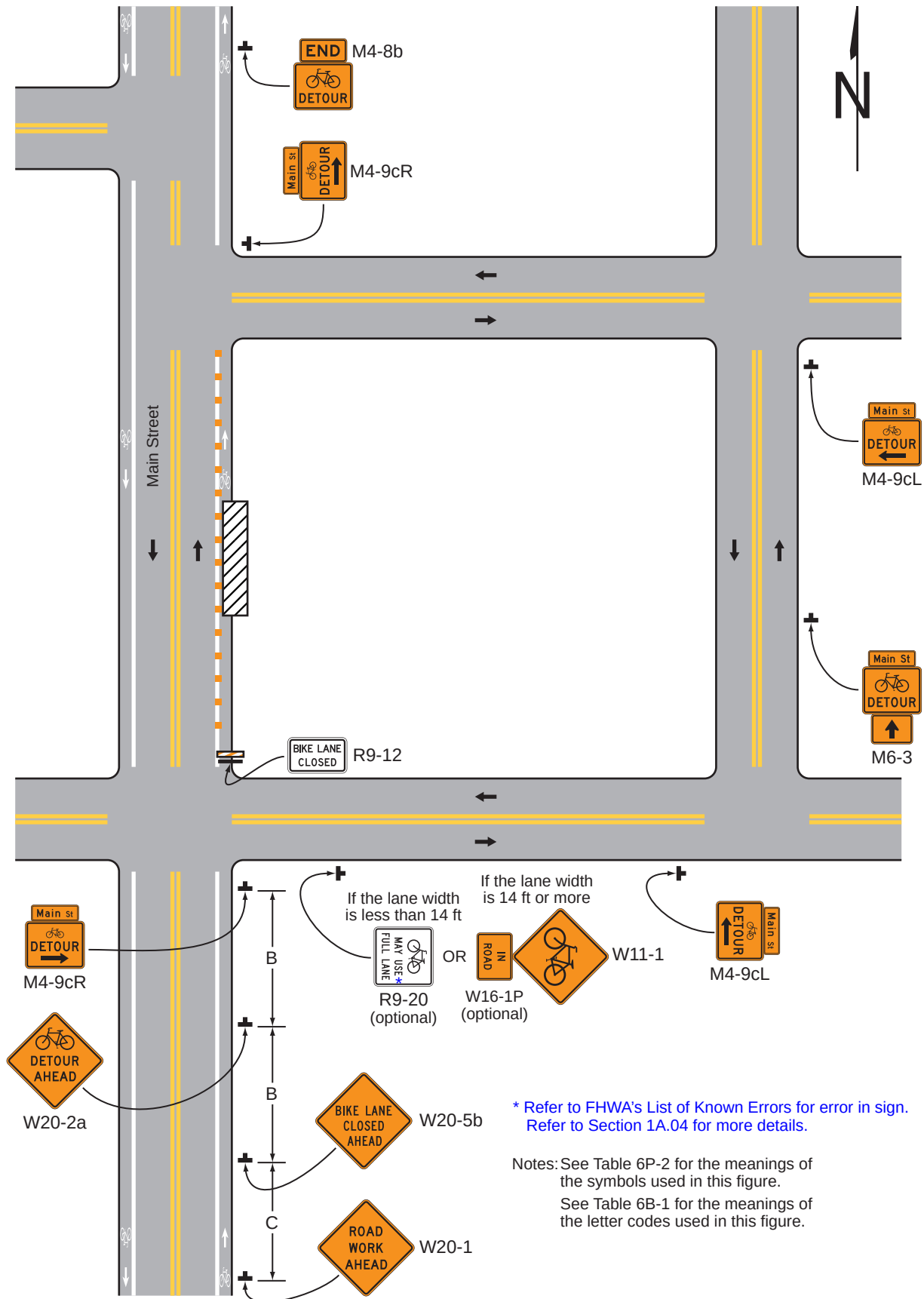
Standard:

5. **Where used, the Street Name sign or Bike Route Name sign shall be placed above the Bike Detour sign.**

Option:

6. If a bicycle lane on a roadway having a speed limit of 30 mph or less is closed, and the adjacent travel lane is less than 14 feet wide, then BICYCLES ALLOWED USE OF FULL LANE (R9-20) signs may be used.
7. If a bicycle lane on a roadway having a speed limit of 30 mph or less is closed, and the adjacent travel lane is at least 14 feet wide throughout the TTC zone, then Bicycle Warning signs in association with IN STREET (W16-1aP) or IN ROADWAY (W16-1P) plaques may be used.

Figure 6P-48. Bicycle Lane Closure with an On-Road Detour (TA-48)



Typical Application 48

Notes for Figure 6P-102(CA) — Typical Application 102(CA) Lane Shift on Road with Low Traffic Volumes

Guidance:

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

Standard:

2. **Workers in the roadway shall wear high-visibility safety apparel as described in Section 6C.04.**

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 9 feet may be used for short-term stationary work on low-volume, low-speed roadways when motor vehicle traffic does not include longer and wider heavy commercial vehicles.
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 6P-102(CA). Lane Shift on Road With Low Traffic Volumes (TA-102(CA))

