TRAFFIC CONTROL REQUIREMENTS FOR NDDOT OPERATIONS ON HIGHWAYS AND STREETS

2025 EDITION

NORTH Dakota | Transportation

Be Legendary.

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Note: This manual provides a written account of how certain activities are performed and is designed to guide and assist staff in performing their functions. When appropriate, there may be deviations from these written procedures due to changes in personnel, policies, interpretation, law, experimentation with different systems, or simply evolution of the process itself. This manual may be changed at any time. Staff are encouraged to review this manual periodically and suggest changes in the manual to keep the manual current and to minimize differences between the manual and actual practices.

Prepared by

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
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Certification

TRAFFIC CONTROL REQUIREMENTS
FOR
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION
OPERATIONS ON HIGHWAYS AND STREETS

WHEREAS, the North Dakota Department of Transportation has published a manual entitled *Traffic Control Requirements for NDDOT Operations on Highways and Streets*, and

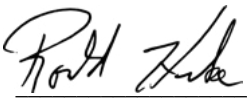
WHEREAS, such manual conforms to the standards set forth in the current NDDOT adopted edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways*, published by the United States Department of Transportation, Federal Highway Administration, and

WHEREAS, pursuant to Chapter 39-13, North Dakota Century Code, the *Manual on Uniform Traffic Control Devices for Streets and Highways* has been adopted by the NDDOT Director as the official standard for use on streets and highways in North Dakota.

NOW, THEREFORE, I do hereby prescribe the manual *Traffic Control Requirements for NDDOT Operations on Highways and Streets*, subject to amendments and addenda which may be adopted by the director, for use by the Department of Transportation personnel in performing their assigned duties on highways and streets in North Dakota.

The *Traffic Control Requirements for NDDOT Operations on Highways and Streets* 2025 version will have an effective date of May 1, 2025.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION



Ron Henke, PE
Director

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Figure Selection Guide

Maintenance Activity	Work Duration		
	Mobile	Short Duration	Short Term Stationary
	(15 Minutes or Less in a 1,000 ft)	(15 Minutes to 1 Hour)	(More than 1 Hour)
Crack Pouring, Polymer Crack Sealing, Bituminous Roadway Milling, Blade Patching, Minimac			8, 9, 11, 12, 13, 14, 15, 16
Snooper, Bucket Truck, Signals		3, 4, 5, 8, 9, 11, 12, 13, 14, 15, 16	3, 4, 5, 8, 9, 11, 12, 13, 14, 15, 16
Lighting, Signs		3, 4, 5, 8, 9, 11, 12, 13, 14, 15	3, 4, 5, 8, 9, 11, 12, 13, 14, 15
Blading Shoulders			4, 5
Chemical Vegetation Control, High Tension Guardrail, Roadside Operations, Safety Appurtenances		3, 4, 5, 8, 9, 11, 12, 13, 14, 16	3, 4, 5, 8, 9, 11, 12, 13, 14, 16
Concrete Repair			8, 9, 11, 12, 13, 14, 15, 16
Bridges		4, 5, 8, 9, 11, 12, 13, 14, 15	4, 5, 8, 9, 11, 12, 13, 14, 15
Drainage Work		3, 4, 5, 8, 9, 16	3, 4, 5, 8, 9, 16
Mowing	1, 2		
Grading, Installing Gravel, Roadway Operations			3, 4, 5, 8, 9, 11, 12, 13, 14, 15, 16
Access Control		3, 4, 5	3, 4, 5
Scotch Patch, Spray Patching, Hand Patching, Mastic		4, 5, 8, 9, 11, 12, 13, 14, 15, 16	4, 5, 8, 9, 11, 12, 13, 14, 15, 16
Shoulders			4, 5, 16
Striping	7, 10, 16		
Debris Removal	3, 4, 16	3, 4, 16	
Sweeping	6, 7, 10, 16		
Pilot Car			8, 9, 16

Not all maintenance activities are listed.

Traffic Control Plan

A Traffic Control Plan is required whenever traffic control devices are used in a work zone. The components of the plan include:

Pre-Job Planning Meeting

Before any work begins, hold a pre-job planning meeting with all crew members to discuss expectations, roles, responsibilities, and project timelines. Refer to the Traffic Control Requirements for NDDOT Operations on Highways and Streets handbook and the Manual on Uniform Traffic Control Devices to determine the appropriate work zone layout. Discuss any necessary deviations due to traffic volume, geography (hills, curves), intersections, railroad notifications, or law enforcement needs. Review applicable Job Hazard Analyses (JHA), Job Safety Analyses (JSA), and Safety Data Sheets (SDS). Check weather forecasts for potential changes.

Assignment of Responsibility

Assign a team member responsible for ensuring the Traffic Control Plan is followed. If flaggers are required, they must be certified. Additionally, establish a flagger schedule to ensure stations are always staffed and breaks are provided.

Equipment and Devices Needed

Make a comprehensive list of all required equipment for the project. Verify that all lights and devices are in good working condition before use.

Verification and Monitoring

Conduct periodic checks of the work zone throughout the day to ensure that all traffic control devices remain visible and are positioned correctly, particularly if the work zone shifts along the roadway.

Documentation

Document the Traffic Control Plan in the daily diary, including:

- Which layout was used
- Any deviations from the standard layout
- Date of the pre-job meeting
- Attendees of the meeting
- Person responsible for ensuring adherence to the Traffic Control Plan
- Dates and types of work being performed
- When the work zone was checked throughout the day and any adjustments made
- When the project was completed

Introduction

This manual serves as a guide for North Dakota Department of Transportation (NDDOT) personnel in the placement of traffic control devices while performing assigned duties on streets and highways in North Dakota. For situations not covered in this manual, refer to the Manual on Uniform Traffic Control Devices (MUTCD), available online at www.mutcd.fhwa.gov.

The layouts in this manual represent desirable standards for normal conditions. However, additional protection is required in more complex or potentially hazardous situations.

Work Zone Safety

Workers face hazards when setting up and removing temporary traffic controle zones. Vehicles equipped with high-intensity rotating, flashing, oscillating, or strobe lights may replace certain work zone items, such as signs and channelizing devices, for short-duration or mobile operations.

Daylight and Non-Work Zone Situations

Figures 1 through 25 depict daylight traffic control scenarios in work zones. Warning signs **shall** be orange.

Figures 26 through 31 depict maintenance situations outside of work zones. In these cases, warning signs **shall** be yellow.

All vehicles must comply with the appropriate standards for vehicle warning lights.

Unless otherwise noted, sign spacing is approximate.

Nighttime Operations Required Clothing

During nighttime operations, workers must wear Class 3 fluorescent yellow-green garments, including upper-body apparel and pants/bibs. Additional lighting, such as guardian angel body lights, may be used to enhance visibility.

Nighttime Flagging Stations

All flagging stations **shall** be illuminated, except in emergency situations.

Nighttime Signs

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

Vehicle Placement

If work activities occur beyond the shoulder, vehicles should be parked beyond the shoulder when possible. If a vehicle is being used as a buffer vehicle, this does not apply.

Temporary Speed Limit Reductions

The NDDOT director, district engineer, or an authorized representative may temporarily reduce the posted speed limit in work areas when necessary.

Note on Snow and Ice Control Operations

This manual does not apply to snow and ice control operations, as these are governed by Chapter 39-13 of the North Dakota Century Code.

Definitions

Work Duration:

Mobile - Work that moves continuously or intermittently with short stops, ensuring no more than 15 minutes is spent within each 1,000-foot segment.

Short-Duration - Work that occupies a location from 15 minutes to 1 hour.

Short-Term Stationary - Daytime work that occupies a location for more than one hour within a single daylight period.

Intermediate-Term Stationary - Work that occupies a location more than one daylight period up to three days, or nighttime work lasting more than one hour.

Long-Term Stationary - Work that occupies a location more than three days.

Road Type:

Expressway - A multi-lane highway, either undivided or divided, designed for through traffic with partial control of access and typically featuring grade separation at major intersections.

Freeway - Any multi-lane, divided highway with full control of access.

Rural - A highway where traffic is normally characterized by lower volume, higher speed, fewer turning conflicts and fewer conflicts with pedestrians.

Urban - A type of street normally characterized by relatively low speed, wide ranges in traffic volume, narrower roadway lanes, frequent intersections, significant pedestrian traffic and more roadside obstacles.

Truck-Mounted Attenuator (TMA):

TMA Level 2 - Impact tested at 43 mph, must be attached to vehicle weighing at least 11,025 lbs. (or the manufacturer's minimum).

TMA Level 3 - Impact tested at 62 mph, must be attached to vehicle weighing at least 16,090 lbs. (or the manufacturer's minimum).

Merging and Shifting Taper:

Merging Taper (L) - Moves traffic laterally from the normal lane to an adjacent lane.

Shifting Taper (1/2L) - Moves through lanes onto an alternate path but does not reduce the number of lanes.

Word Usage:

Shall - This indicates a mandatory requirement. It means the action is required and necessary under the stated conditions. Shall statements are indicated in boldface print.

Should - This indicates an advisory or recommended practice. While not mandatory, it is highly advised, unless there is a valid reason not to.

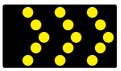
May - This indicates a permissive condition. The action is allowed but not required. The option is provided to the user to apply based on circumstances and judgment.

Key to Symbols Used


AFAD


Arrow panel support or trailer (shown facing down)


Channelizing device


Chevron Panel


Direction of traffic


Flagger


Mower

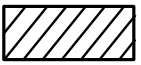

Sign (shown facing left)

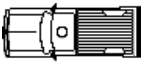

Surveyor


Truck-mounted attenuator (TMA)


Type 3 barricade

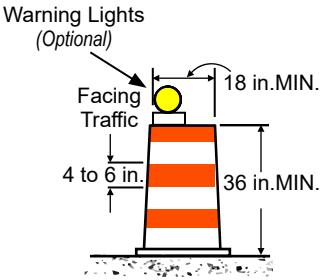

Warning lights


Work space

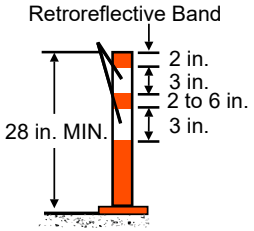

Work vehicle


Portable Rumble Strips

Channelizing Devices



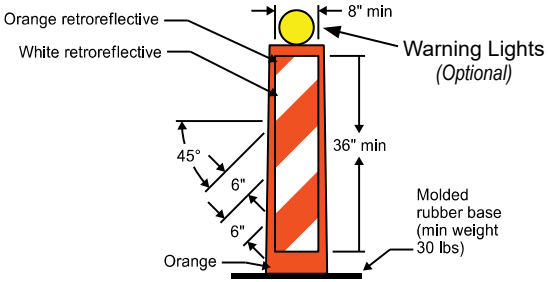
DRUM



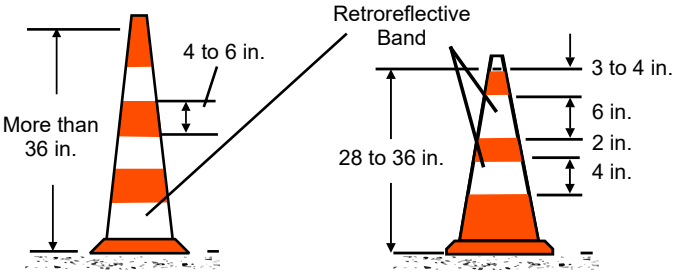
Night and/or Freeway
High-Speed Roadway (≥ 45 mph)

TUBULAR MARKER

* For use on all roads.



STACKABLE VERTICAL PANEL

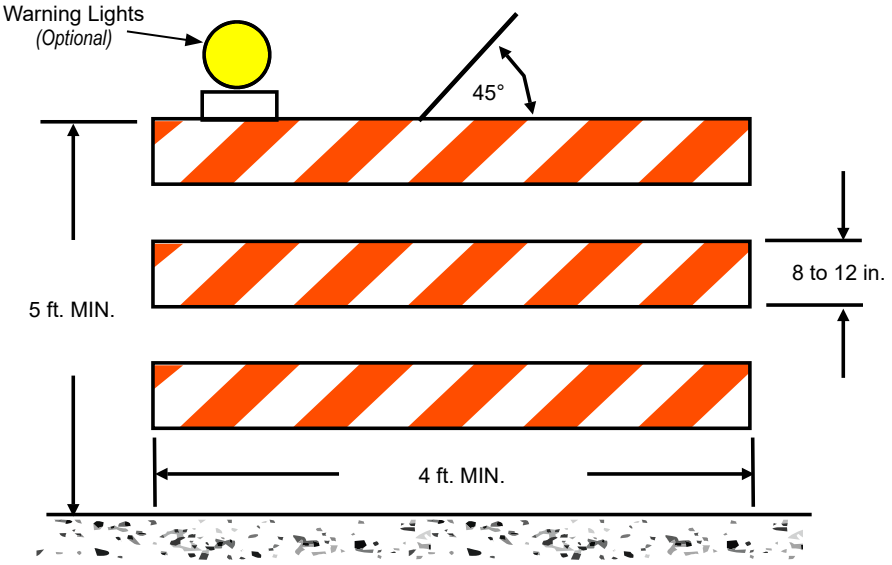


Night and/or Freeway
High-Speed Roadway (≥ 45 mph)

CONES

NOTE: Where channelizing devices are used to channelize pedestrians, there **shall** be continuous detectable bottom and top surfaces to be detectable to users of long canes. The bottom of the bottom surface **shall** be no higher than 2 inches above the ground. The top of the top surface **shall** be no lower than 32 inches above the ground.

Channelizing Devices

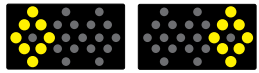


TYPE 3 BARRICADE

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

NOTE: Where channelizing devices are used to channelize pedestrians, there **shall** be continuous detectable bottom and top surfaces to be detectable to users of long canes. The bottom of the bottom surface **shall** be no higher than 2 inches above the ground. The top of the top surface **shall** be no lower than 32 inches above the ground.

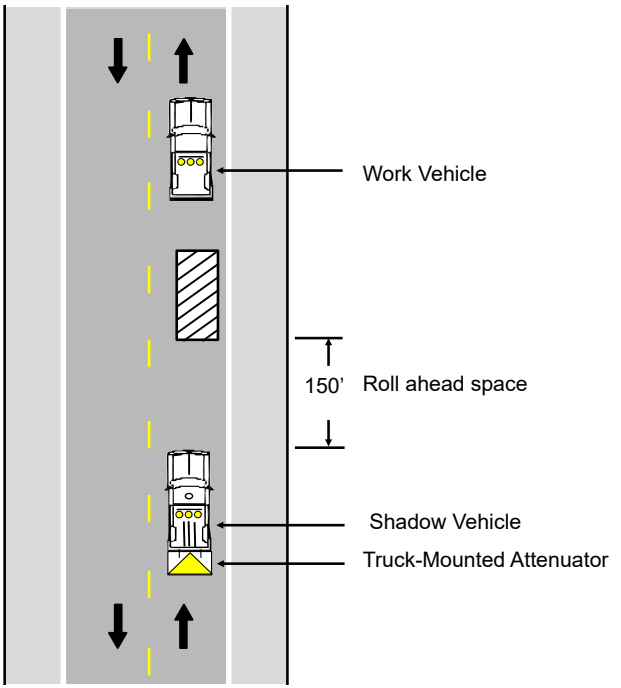
Advance Warning Arrow Board Specification

Operating Mode	Panel Display (Element layout for Type C panel shown.)
1. The following mode **shall** be provided.	(Right arrow is shown, left arrow is similar)
Sequential Chevron	 Move/Merge Right Directional
2. At least one of the following two modes **shall** be provided:	
Flashing Four Corners	 Caution
Alternating Flashing Diamonds	 Caution

Restrictions on Arrow Boards

Arrow boards **shall** not be used in the directional mode on two-lane, two-way roadways (driving lanes or shoulders). The caution mode is acceptable for these situations. Auxiliary lanes are considered multi-lane.

TMA Diagram



TMA Positioning

Proper positioning of the TMA vehicle within the work zone is critical to its effectiveness. The TMA vehicle location should provide sufficient warning to approaching traffic and maximum protection for workers. TMA must be + - 1 inch from level when attached to towing vehicle.

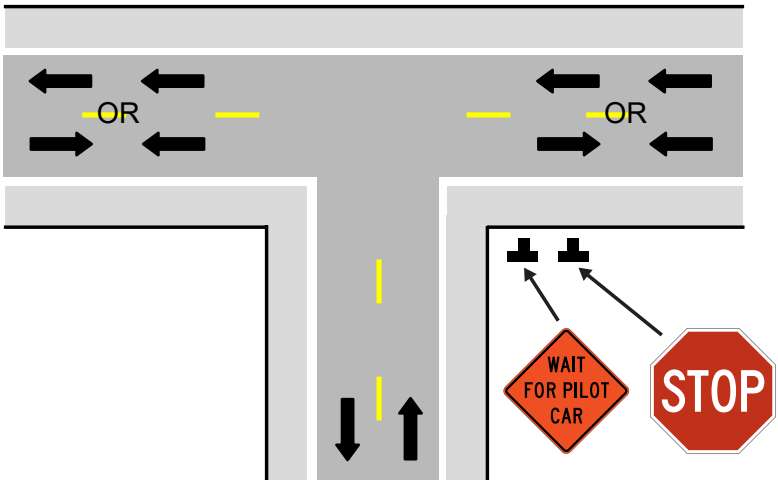
Mobile Operation

During mobile operations, operate your protective vehicle as you would any other vehicle. Keep the vehicle in gear and aligned with traffic at all times. Maintain your speed to provide a minimum roll-ahead space of 150 feet. Pay attention to hills, curves or other sight distance items that might be present.

Short Stationary or Stationary Operation

The wheels of the protective vehicle should be straight ahead in alignment with traffic. In addition, the emergency brake **shall** be set and the transmission put into neutral. Maintain a minimum roll-ahead distance of 150 ft.

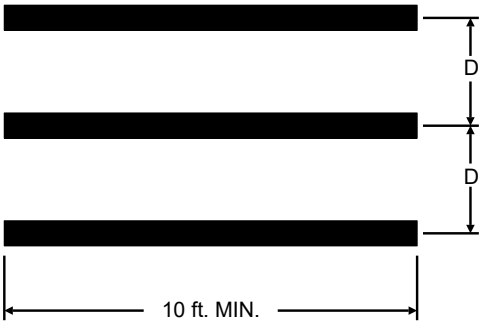
Pilot Car



At major intersections within pilot car control area.

1. Mount the “Pilot Car Follow Me” sign on the rear of the pilot car.
2. The length of pilot car operation should be kept as short as possible to ensure delays to motorists are no more than 15 minutes.
3. Cones may be eliminated in figures 8, 9 and 16 if a pilot car is used.
4. Stop sign may be existing.
5. Two flaggers **shall** be used for pilot car operations. See page 13 if automatic flagger assistance device is used.

Portable Rumble Strips



Posted Speed Limit	Center to Center Distance Between Strips (ft.)
	D
40 mph or less	10
Greater than 40 mph to 55 mph	15
Greater than 55 mph	20

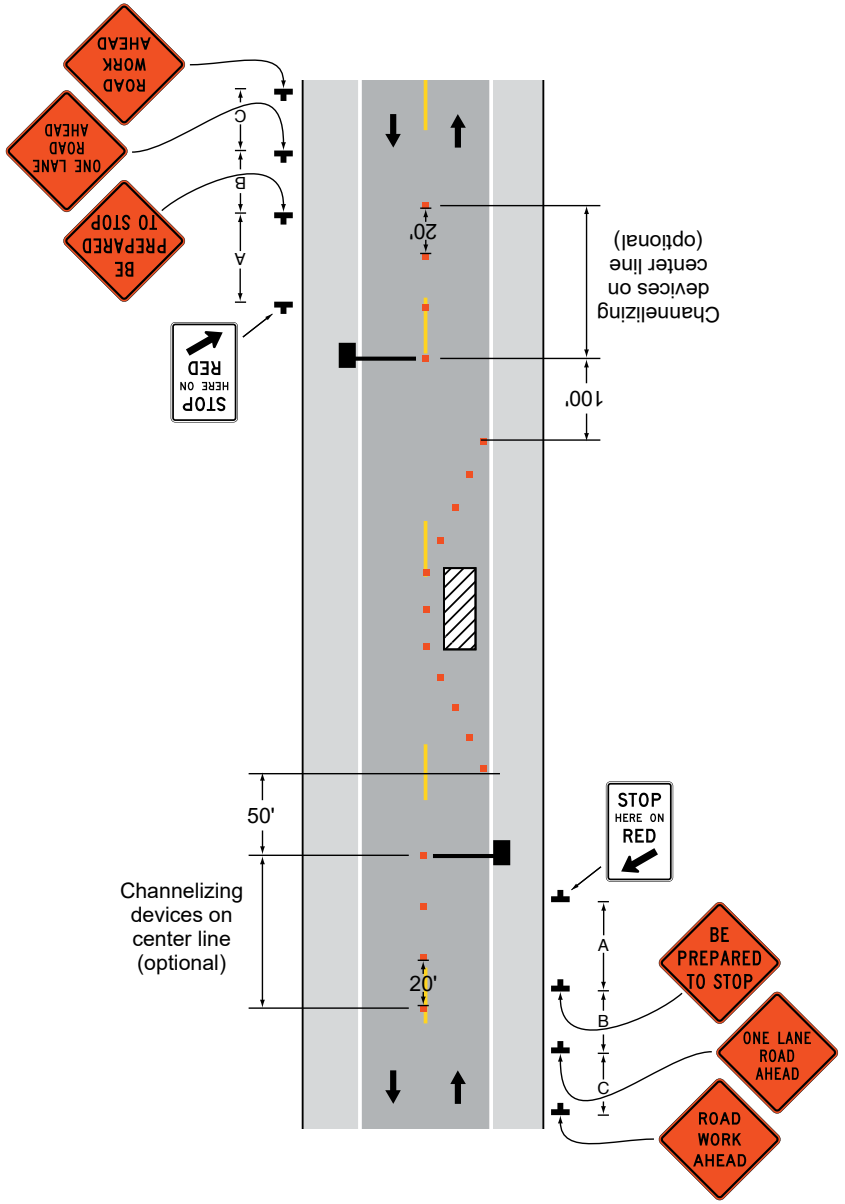
NOTES: 1. Portable rumble strips shall be used at locations where all the following five parameters are met:

- **A Flagger is present. The FLAGGER symbol sign shall be used whenever a flagger is present. The BE PREPARED TO STOP sign shall be used on two-lane roads whenever a flagger is present. The BE PREPARED TO STOP sign is not required on multi-lane roads. See Figures 7, 8, 12, 13, 17, 18, and 26 for layouts .**
- **Placed on a paved surface.**
- **Pre-activity speeds are greater than 45 mph.**
- **Location is not signed as a pre-activity stop condition.**
- **Scheduled work with short-term stationary duration.**

2. Portable rumble strips are not required for the following:
   - Emergency work
   - Mobile work
   - Non-scheduled work
   - Short-duration work

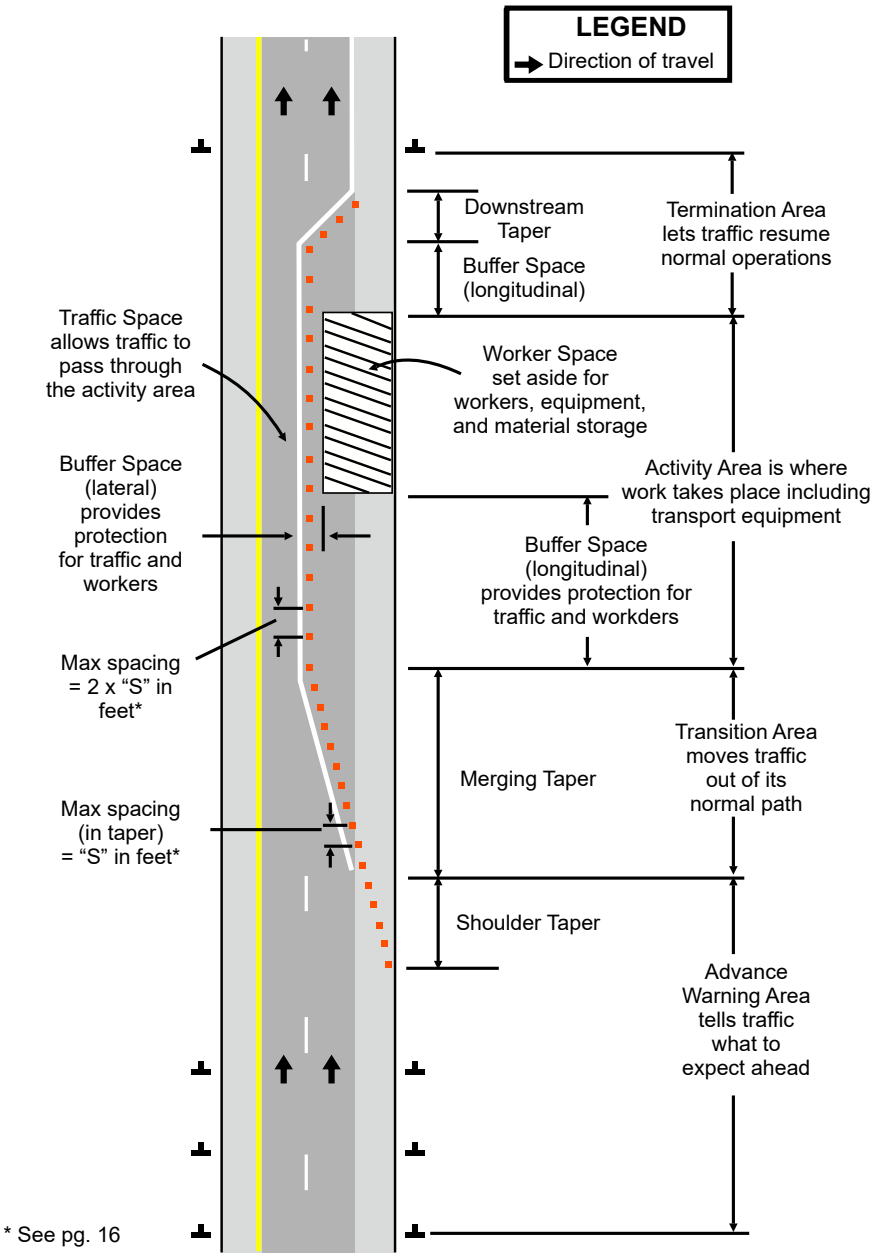
3. **RUMBLE STRIPS AHEAD sign shall be used in conjuction with the portable rumble strips.**

Automated Flagger Assistance Device (AFAD)



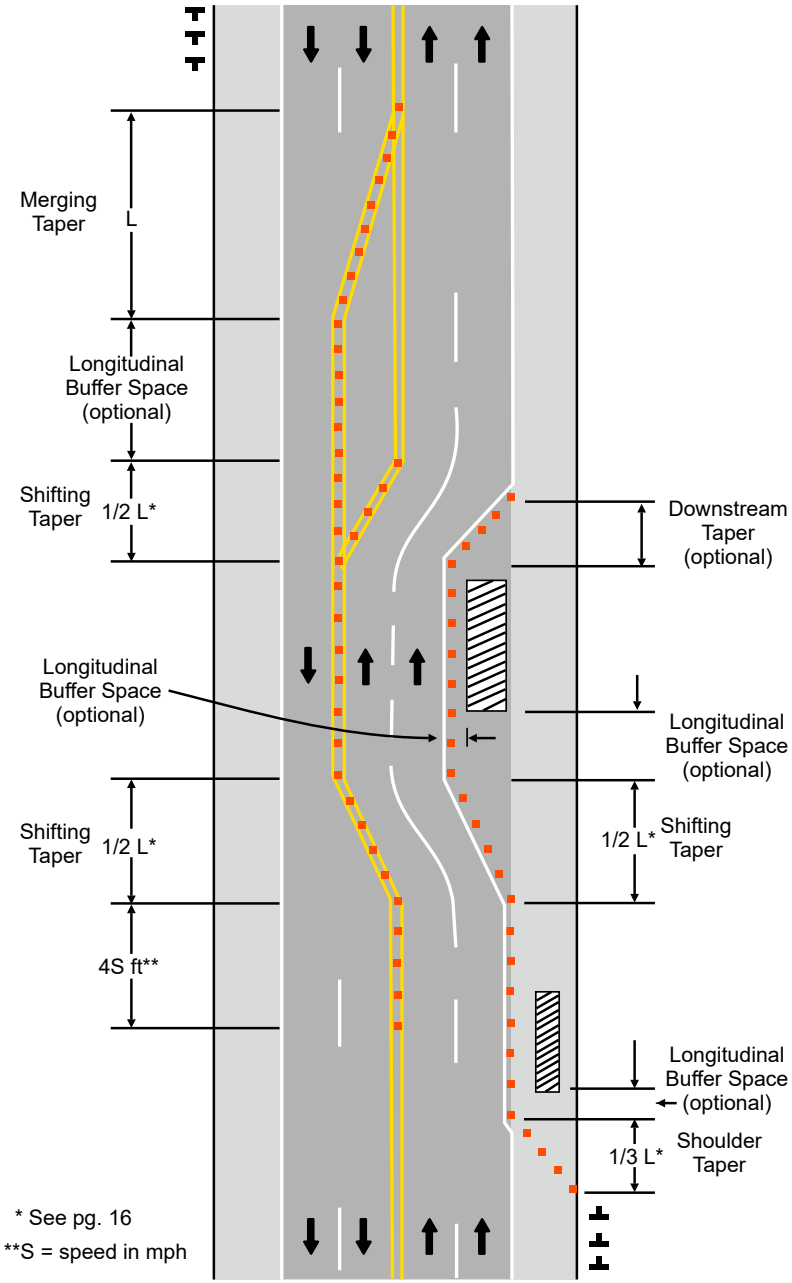
1. **When using a single operator, they shall be located so they can see traffic at both AFAD locations.**
2. AFADs may be used where only one lane of approaching traffic requires control. The "Stop Here on Red" sign can be mounted on the AFAD or placed on the ground.
3. AFAD can be used in pairs or in conjunction with a flagger.

Component Parts of a Temporary Traffic Control Zone



* See pg. 16

Types of Tapers and Buffer Spaces



Taper Length Criteria For Temporary Traffic Control Zones

Type of Taper	Taper Length (L)
Merging Taper	at least L
Shifting Taper	at least 0.5L
Shoulder Taper	at least 0.33L
One-Lane, Two-Way Traffic Taper	100 ft. maximum
Downstream Taper	100 ft. per lane

(100 ft. taper = 5 cones spaced 20 ft. apart)

FORMULAS FOR DETERMINING TAPER LENGTHS

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

Where:
L = taper length in feet
W = width of offset in feet or width of shoulder + 2'
S = Speed limit prior to construction

Tapers, Device Spacing, and Buffer Spaces

	Minimum Merging Taper Length (L) in Feet		Minimum Shifting Taper Length (0.5 L) in Feet		10' Shoulder Taper (0.33L) in Feet	Maximum Device Spacing in Feet		Buffer Space in Feet
	Width of offset (w) in Feet		Width of offset (w) in Feet					
Speed (S) in mph	**11'**	**12'**	**11'**	**12'**		**Along Taper (S)**	**Along Tangent (2S)**	
25 or below	115	125	60	65	35	25	50	155
30	165	180	85	90	50	30	60	200
35	225	245	115	125	70	35	70	250
40	295	320	150	160	90	40	80	305
45	495	540	250	270	150	45	90	360
50	550	600	275	300	165	50	100	425
55	605	660	305	330	185	55	110	495
60	660	720	330	360	200	60	120	570
65	715	780	360	390	215	65	130	645
70	770	840	385	420	235	70	140	730
75	825	900	415	450	250	75	150	820

All shoulder tapers are 1/3(L)

Traffic Control Criteria

Signs: The sign spacings shown are the minimum recommended for typical situations. The spacing may be adjusted to fit the existing grade and roadside obstructions. The minimum sign size shall be 36” on 2-lane, 2-way roads. The minimum sign size **shall** be 48” on roads of 4 or more lanes. Orange flags may be affixed to signs in urban applications. The bottoms of signs mounted on temporary supports **shall** be no less than 1’ above pavement elevation. Higher mountings are desirable.

Cones: The cones shall be at least 28" high. The cone spacing in tapers shall be a maximum of the distance in feet of the speed limit in mph. Cone spacing in channelization **shall** be a maximum of twice the distance in feet of the speed limit in mph.

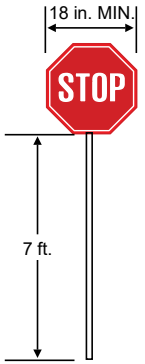
Distance: The mileage referred to is the actual work zone distance, not including the distance required for signing.

Arrow Boards: The arrow boards shall be Type B, 60” x 30” or Type C, 96” x 48”. Minimum mounting height **shall** be 7’ above the roadway to the bottom of the board, except that vehicle-mounted boards shall be as high as practicable.

Safety Apparel: All workers must wear fluorescent yellow-green colored safety apparel meeting Performance Class 3 requirements of the ANSI/ISEA 107-2020 or newer standard.

Flagger Equip.: All flagger equipment shall comply with the current edition of the North Dakota Flagging Handbook.

Stop/Slow Paddle



Seal Coats

Two-Lane Roads:

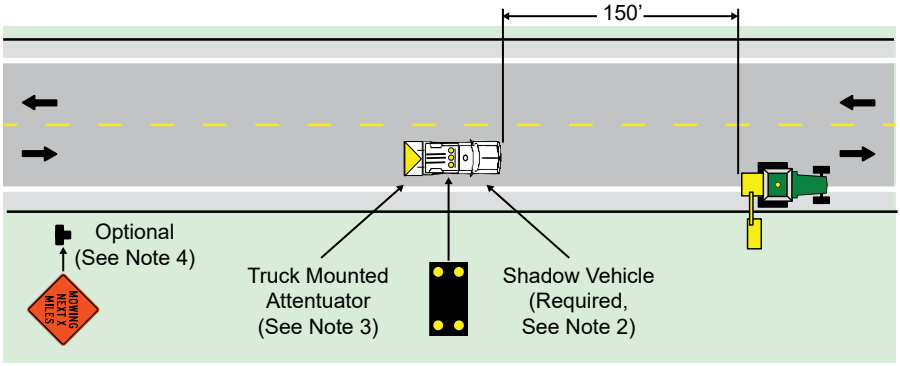
1. **The NO CENTERSTRIPE, DO NOT PASS, FRESH OIL LOOSE ROCK, and SPEED LIMIT signs shall be placed just after all important intersections and every 5 miles in both directions of travel, shall remain covered until the seal coat operation is within 3 miles of that portion of the project, and shall remain until the project is complete. If the newly sealed areas continue to present a flying chip hazard after seal operations have been halted for the day or week, these signs shall be placed and covered, as above, and uncovered in the evenings and on weekends.**
2. **The ROAD WORK AHEAD, BE PREPARED TO STOP, and FLAGGER symbol shall be set up in both directions of travel and taken down daily. These signs shall be moved ahead each day to maintain the required spacing from the work area as the seal work progresses.**
3. **The short-term centerline striping shall be applied to the entire length of the sealed area before sunset each day. The broken line shall be 4 inches wide and either 4 feet long with 36-foot unpainted gaps or 10 feet long with 30-foot unpainted gaps. The 4-foot stripe is generally used on the first pass of the seal coat where the stripe will be covered up again. The 10-foot stripe will generally be used after the second pass as the final stripe. The barrier stripe shall be a double 4-inch wide stripe and cover the full length of the no-passing zone.**
4. Refer to the NDDOT Design Manual, Standard Specifications, and all applicable Standard Drawings (including D-704-15 and D-704-20) for signing and striping requirements.
5. Speed limit reductions can be made in 30 mph increments.

Multi-Lane Roads:

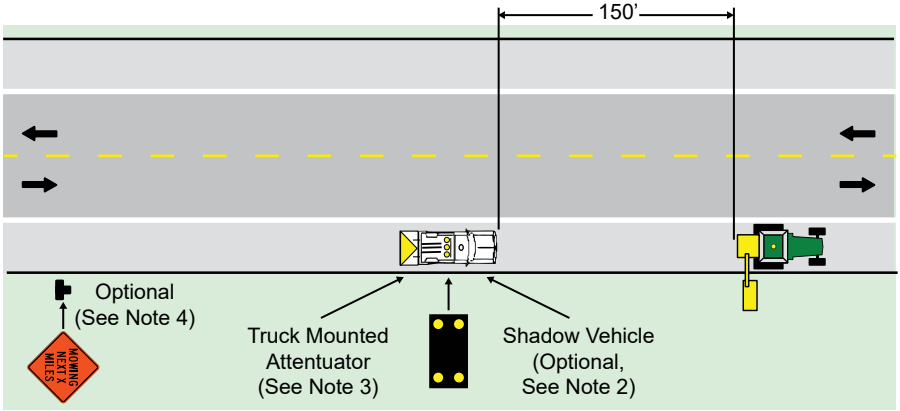
1. **The speed limit through the work zone shall be 10 mph less than the posted speed in areas where no work is present. Speed limit reductions can be made in 30 mph increments.**
2. **The short-term pavement striping shall be applied before the traffic control work zone is taken down or moved ahead and the roadway opened to traffic. The broken line between lanes shall be 4 inches wide, 10 feet long with 30-foot unpainted gaps.**
3. Refer to the NDDOT Design Manual, Standard Specifications, and all applicable Standard Drawings (including D-704-34) for signing and striping requirements.

Notes for Figure 1
Mowing Operation on a Two-Lane Road

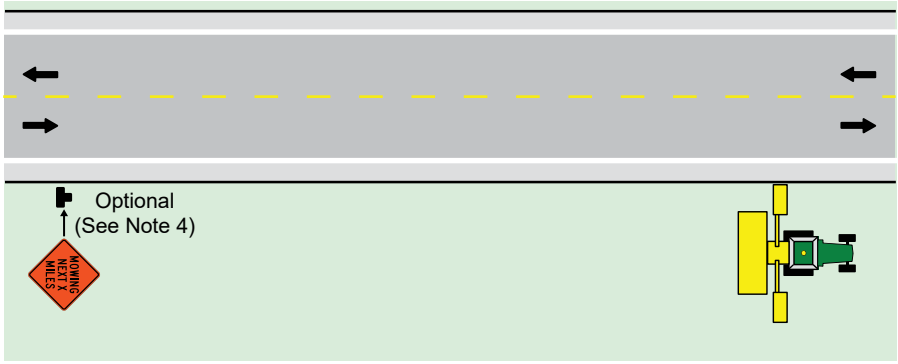
1. **If an arrow board is used, the caution mode shall be activated.**
2. Mowing operations should be performed without encroaching upon the roadway and/or shoulder whenever possible. **A shadow vehicle shall be used if the tractor utilizes any part of the travel lane to perform the mowing operation.** The shadow vehicle is optional when the tractor will remain on or beyond the shoulder while actively mowing.
3. **A truck-mounted attenuator (TMA) shall be used on the shadow vehicle when mowing encroaches on or enters the roadway.** A TMA may be used on the shadow vehicle when mowing occurs on the shoulder.
4. The "Mowing Next X Miles" sign may be used.
5. Mowers performing operations that do not require a shadow vehicle may utilize the roadway to navigate around roadside obstacles such as utility poles, traffic signs, etc. without the protection of a shadow vehicle. Care is required when entering the roadway.



Mowing Operation: Encroaching on a Two- Lane Road



Mowing Operation: Shoulder Area on a Two- Lane Road

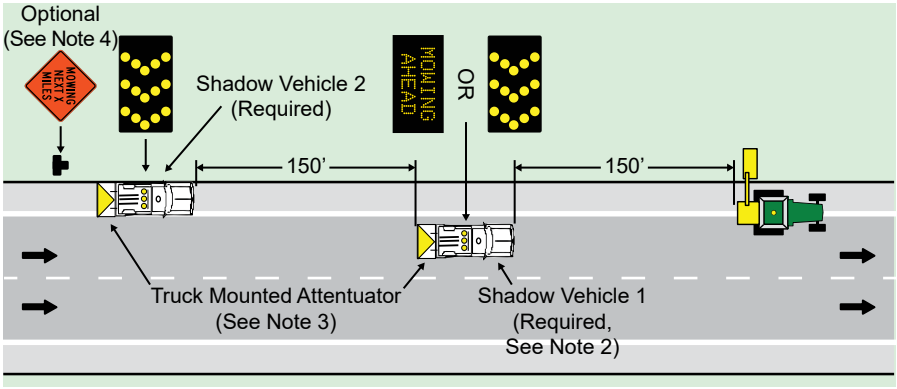


Mowing Operation: Beyond a Shoulder on a Two-Lane Road

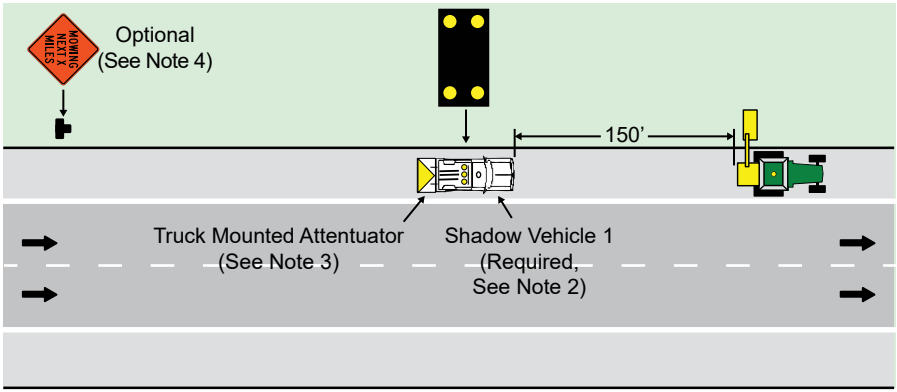
Figure 1: Mowing Operation Two-Lane Road

Notes for Figure 2
Mowing Operation on a Multi-Lane Road

1. **If an arrow board is used, the caution mode shall be activated for work beyond shoulder and on shoulder. Sequential chevron shall be used for work that encroaches on the roadway.**
2. **Shadow vehicle 1 and 2 shall both be used if the tractor utilizes any part of the travel lane. Shadow vehicle 1 shall be used if the tractor utilizes any part of the shoulder.** The shadow vehicle is optional when the tractor will remain beyond the shoulder while actively mowing.
3. **A truck-mounted attenuator (TMA) shall be used on the shadow vehicle when mowing encroaches on or enters the shoulder or roadway.**
4. The "Mowing Next X Miles" sign may be used.
5. Mowers performing operations that do not require a shadow vehicle may utilize the roadway to navigate around roadside obstacles such as utility poles, traffic signs, etc. without the protection of a shadow vehicle. Care required when entering the roadway.



Mowing Operation: Encroaching on a Multi-Lane Road



Mowing Operation: Shoulder Area on a Multi-Lane Road

Mowing Operation: Beyond a Shoulder on a Multi-Lane Road

Figure 2: Mowing Operation Multi-Lane Road

Notes for Figure 3
Work Beyond a Shoulder

1. **If the work space is in the median of a divided highway, an advance warning sign shall also be placed on the left side of the directional roadway; and a matching set of signs for traffic from the opposite direction.**
2. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. They shall only be used as a supplement.**
3. The sign illustrated in this figure may be omitted where the work space is behind a barrier, more than 2 feet behind the curb, or 15 feet or more from the edge of any roadway.
4. For short-term, short-duration or mobile operations, all signs and channelizing devices may be eliminated if a vehicle with activated high-intensity rotating, flashing, oscillating, or strobe lights is used.

Road Type	Distance (ft.)
	A (min.)
Urban - Low Speed (40 mph of less)	100
Urban - High Speed (greater than 40 mph)	350
Rural	500
Urban Expressway/Freeway (60 mph or less)	750
Rural Expressway/Freeway (greater than 60 mph)	1,000

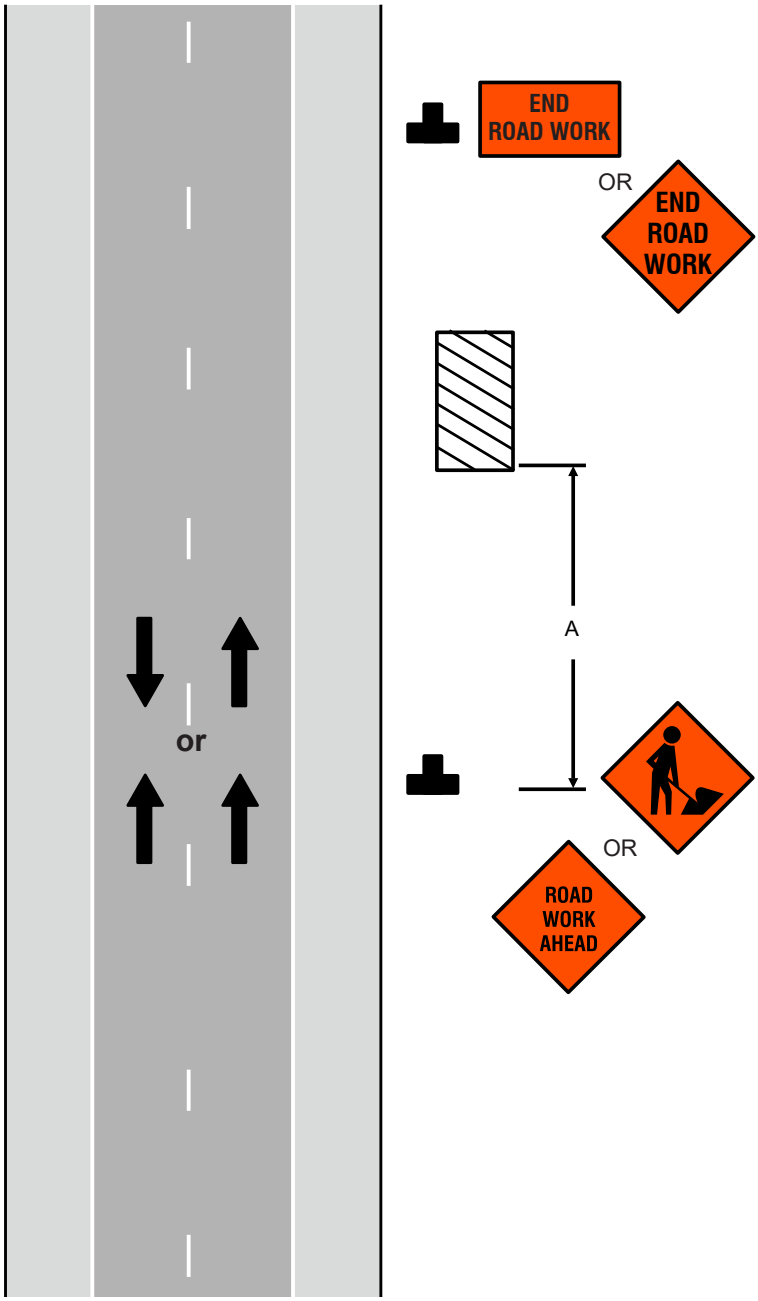


Figure 3: Work beyond a shoulder
(see Note 1 for multi-lane operations)

Notes for Figure 4
Work on a Shoulder

1. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. They shall only be used as a supplement.**
2. **For stationary operations, when paved shoulders having a width of 8 feet or more are closed, at least one advance warning sign shall be used. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the work space and direct vehicular traffic to remain within the traveled way.**
3. **If an arrow board is used, it shall be used in caution mode.**
4. For 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. All signs in the sign series should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.
6. If used, the shadow vehicle may be equipped with a truck-mounted attenuator.

Road Type	Distance (ft.)	
	A (min.)	B (min.)
Urban - Low Speed (40 mph of less)	100	100
Urban - High Speed (greater than 40 mph)	350	350
Rural	500	500
Urban Expressway/Freeway (60 mph or less)	750	1,000
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500

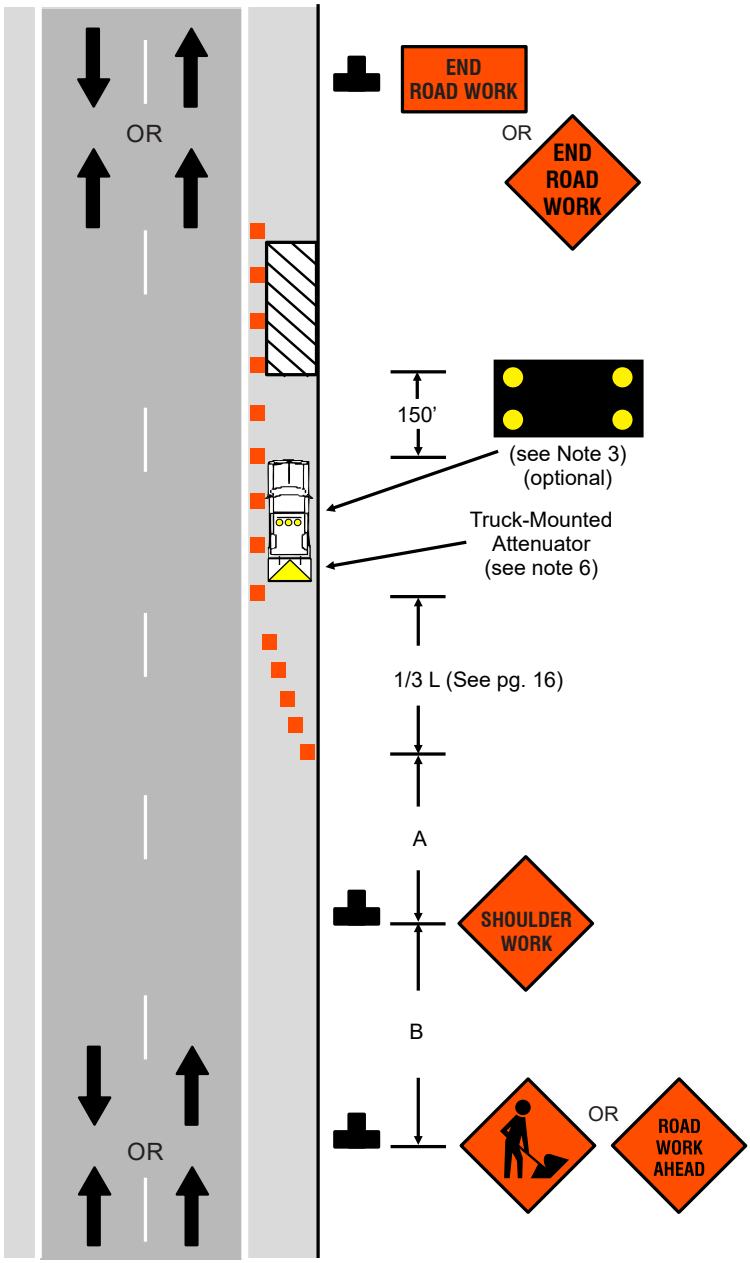


Figure 4: Work on a shoulder
(see Note 5 for multi-lane operations)

Notes for Figure 5
Shoulder Work With Minor Encroachment on a Two-Lane Road

1. **If an arrow board is used for an operation on the shoulder, the caution mode shall be used.**
2. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. They shall only be used as a supplement.**
3. All lanes should be a minimum of 10 feet in width as measured to the near face of the channelizing devices.
4. The treatment shown may be used on a minor road having low speeds. For higher speed traffic conditions and divided highways, a lane closure should be used.
5. For short-term (more than 1 hour) 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.
6. Where the opposite shoulder is suitable for carrying traffic and of adequate width, traffic lanes may be shifted by use of closely spaced channelizing devices, provided that the minimum lane width of 10 feet is maintained.
7. Additional advance warning may be appropriate, such as a ROAD NARROWS sign.
8. Temporary traffic barriers may be used along the work space.
9. The shadow vehicle may be omitted if a taper and channelizing devices are used.
10. A truck-mounted attenuator may be used on the shadow vehicle.
11. For short-duration (15 minutes to 1 hour) 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.

Road Type	Distance (ft.)
	A (min.)
Urban - Low Speed (40 mph or less)	100
Urban - High Speed (greater than 40 mph)	350
Rural	500

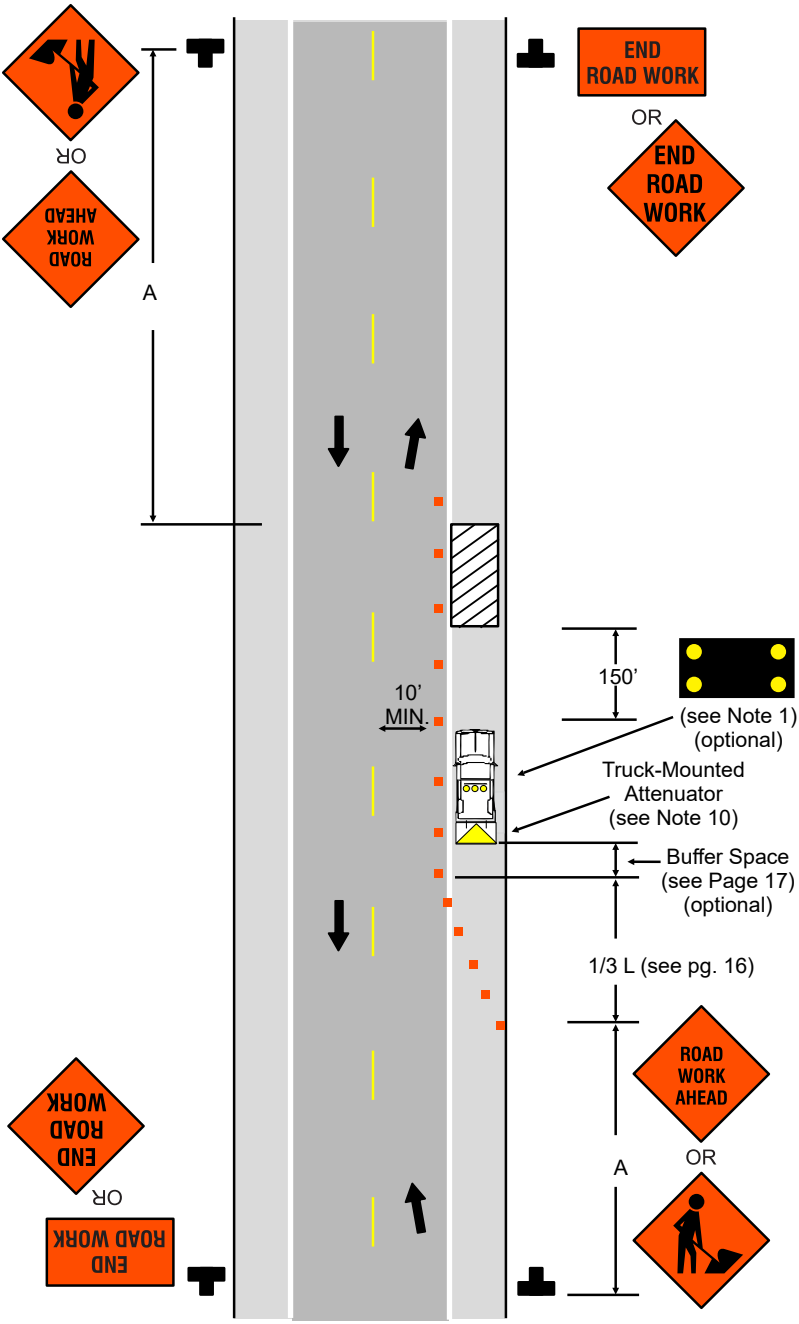


Figure 5: Shoulder work with minor encroachment on a two-lane road

Notes for Figure 6
Short-Duration or Mobile Operation on a Shoulder

1. **In those situations where the distance between the advance signs and the work is 2 to 5 miles, the ROAD WORK NEXT XX MILES shall be used, or a Supplemental Distance plaque shall be used with the ROAD WORK AHEAD sign.**
2. **Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. They shall only be used as a supplement.**
3. **If an arrow board is used for an operation on the shoulder, the caution mode shall be used.**
4. **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.**
5. In those situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 5 miles.
6. Warning signs may be omitted when the work and shadow vehicles display high-intensity rotating, flashing, oscillating, or strobe lights.
7. Shadow vehicles are used to warn motor vehicle traffic of the operation ahead. A truck-mounted attenuator may be used on the shadow vehicle.
8. All signs in the sign series should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected. Refer to figure 10 if work occurs on the left side of the roadway for a divided or one-way street.

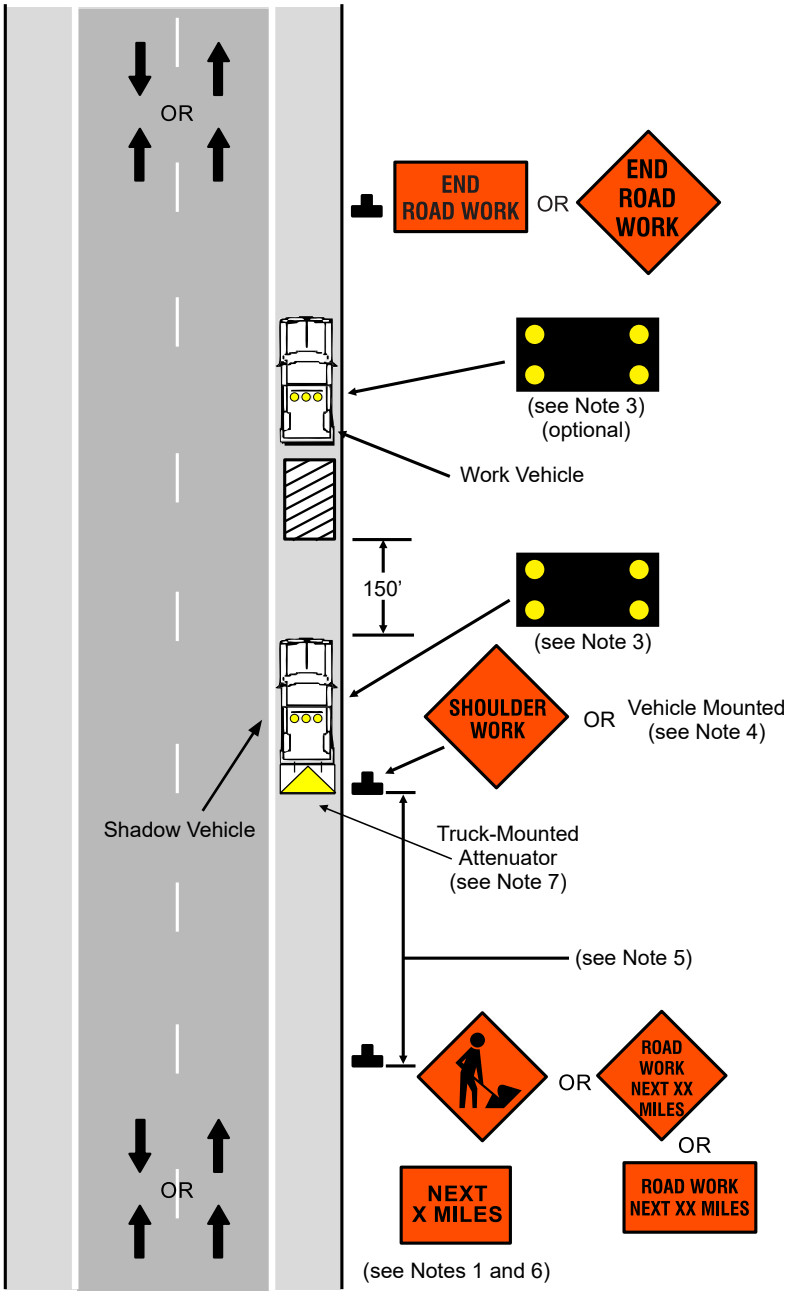


Figure 6: Short-duration or mobile operation on a shoulder
(see Note 8 for multi-lane operations)

Notes for Figure 7
Mobile Operation on a Two-Lane Road

1. **All vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. They shall only be used as a supplement.**
2. **If an arrow board is used, it shall be used in the caution mode.**
3. **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.**
4. Where practical and needed, the work and shadow vehicle should pull over periodically to allow vehicular traffic to pass.
5. Shadow vehicles are used to warn motor vehicle traffic of the operation ahead. 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 distance between the work and shadow vehicles may vary according to terrain, paint drying time, and other factors.
7. 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.
8. A truck-mounted attenuator may be used on the shadow vehicle or on the work vehicle.

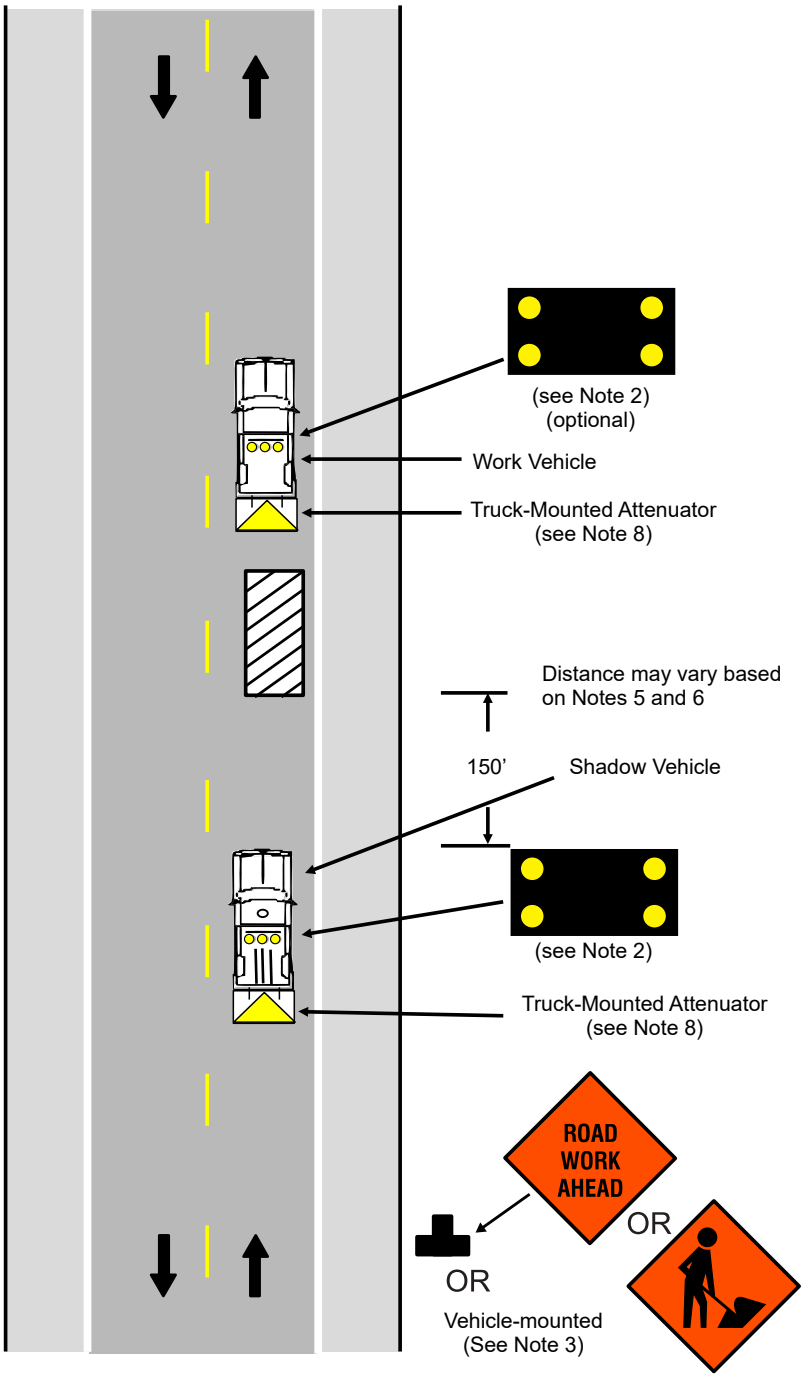


Figure 7: Mobile operation on a two-lane road

Notes for Figure 8
Lane Closure on a Two-Lane Road
Using Flaggers Without Reduced Speed

1. For high-volume roads and low-volume roads with long work zones or reduced stopping sight distance, two flaggers should be used. A single flagger may be used for low-volume situations (less than 400 vehicles per day) with short work zones, on straight roadways, and where the flagger is visible to road users approaching from both directions. **Flaggers shall be used. The FLAGGER symbol sign shall be used in conjuction with the flagger, positioned a minimum distance of "A" and a maximum distance of 1,000 feet in advance of the flagger. The BE PREPARED TO STOP sign shall also be used, positioned a minimum distance of "1/2 B" in advance of the FLAGGER symbol sign.**
2. **Portable rumble strips shall be used at locations where the parameters on page 12 are met.** Portable rumble strips are not required for emergency, mobile, non-scheduled, or short-duration work. **RUMBLE STRIPS AHEAD sign shall be used in conjunction with the portable rumble strips. If portable rumble strips are not used, position the ROAD WORK AHEAD sign a minimum of "C" in advance of the ONE LANE ROAD AHEAD sign.**
3. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration (15 minutes to 1 hour) operations.
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.
5. A truck-mounted attenuator may be used on Shadow Vehicle.
6. Automated Flagger Assistance Devices may be used in situations where there is only one lane of approaching traffic in the direction to be controlled. See page 13.
7. Pilot car may be used. See page 11.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Rural	500	500	500

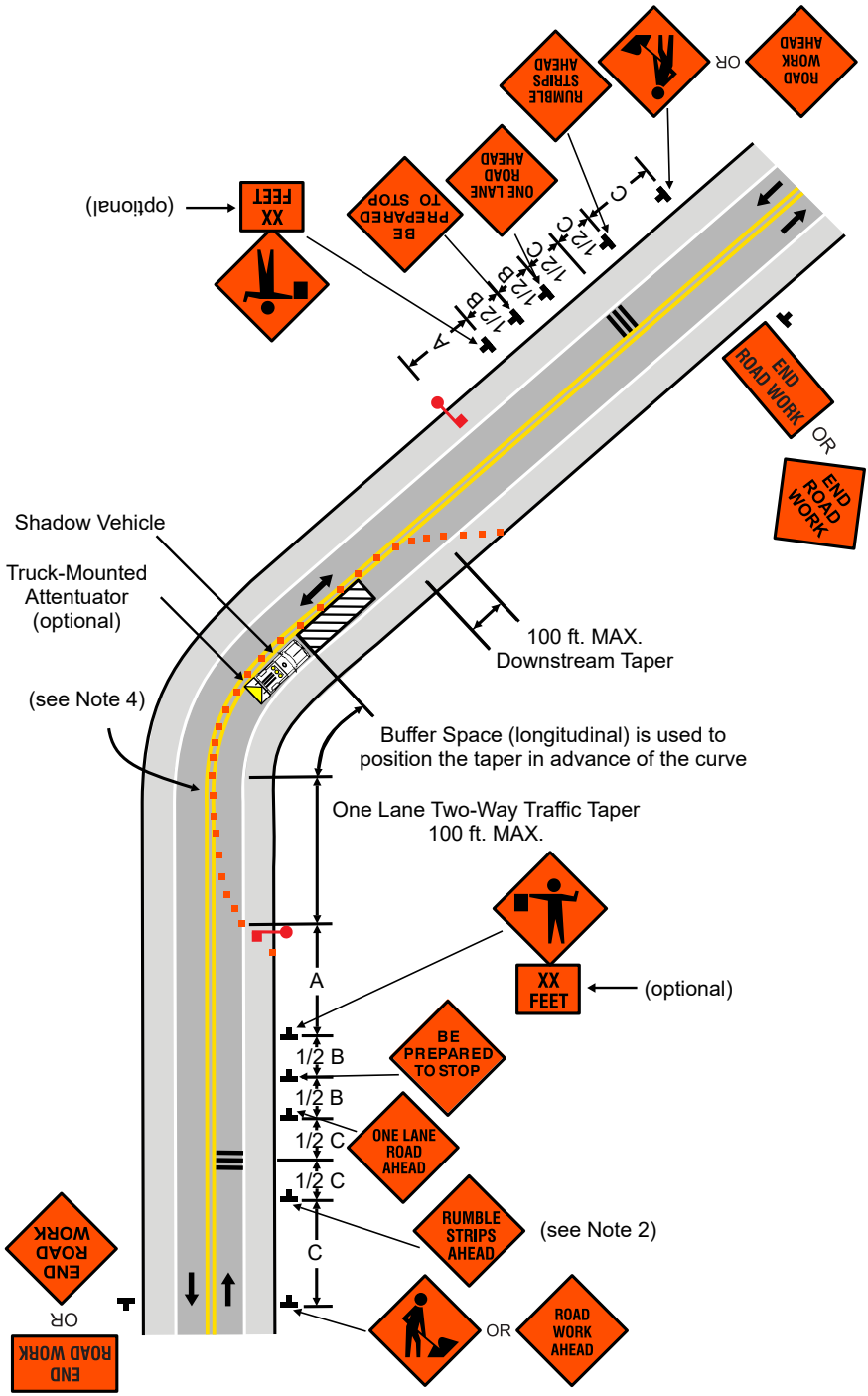


Figure 8: Lane closure on a two-lane road using flaggers without reduced speed

Notes for Figure 9
Lane Closure on a Two-Lane Road
Using Flaggers With Reduced Speed

1. **The notes for Figure 8 shall also apply to Figure 9.**
2. **SPEED LIMIT signs shall be 36" x 48" in size. Speed limits can be reduced in increments of no more than 30 mph. A MINIMUM FEE $80 plate shall be attached below the reduced SPEED LIMIT sign. Existing speed limit signs within a reduced speed zone shall be covered.** REDUCED SPEED AHEAD signs should be W3-5 and 48" x 48". **The speed limit shall be reestablished "A" after the end of the project limits**.
3. SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT sign is not required if the work is less than 15 days. If the sign is used, position the sign "C" in advance of the ROAD WORK AHEAD sign.
4. Pilot car may be used. See page 11.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Rural	500	500	500

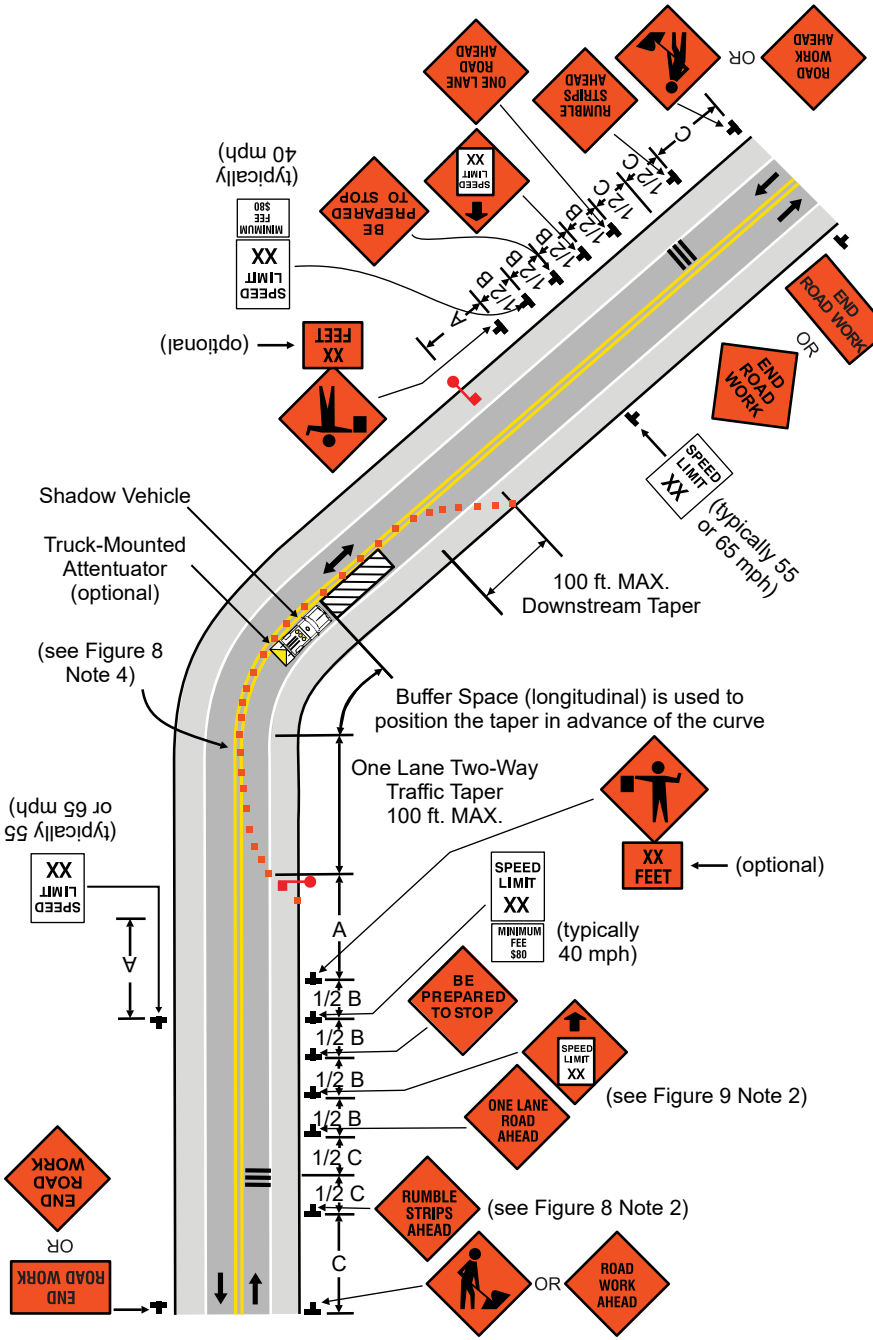


Figure 9: Lane closure on a two-lane road using flaggers with reduced speed

Notes for Figure 10
Mobile Operation on a Multi-Lane Road

1. **Arrow boards shall, as a minimum, be Type B, with a size of 60" x 30". Type C, 96" x 48", is recommended.**
2. **Shadow Vehicle 1 shall be equipped with a truck-mounted attenuator and shall be equipped with an arrow board.**
3. **All vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights. Vehicle hazard warning signals shall not be used instead of the vehicle's high-intensity rotating, flashing, oscillating, or strobe lights. They shall only be used as a supplement.**
4. **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.**
5. **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.**
6. Shadow Vehicle 2 should be equipped with an arrow board, and should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.
7. 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. 150' is the roll ahead distance for the Truck-Mounted Attenuator.
8. Work should normally be accomplished during off-peak hours.
9. 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 10 feet 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.
10. A truck-mounted attenuator may be used on Shadow Vehicle 2 and on the work vehicle.
11. 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. Where adequate shoulder width is not available, Shadow Vehicle 3 may drive partially in the lane. A truck-mounted attenuator may be used.

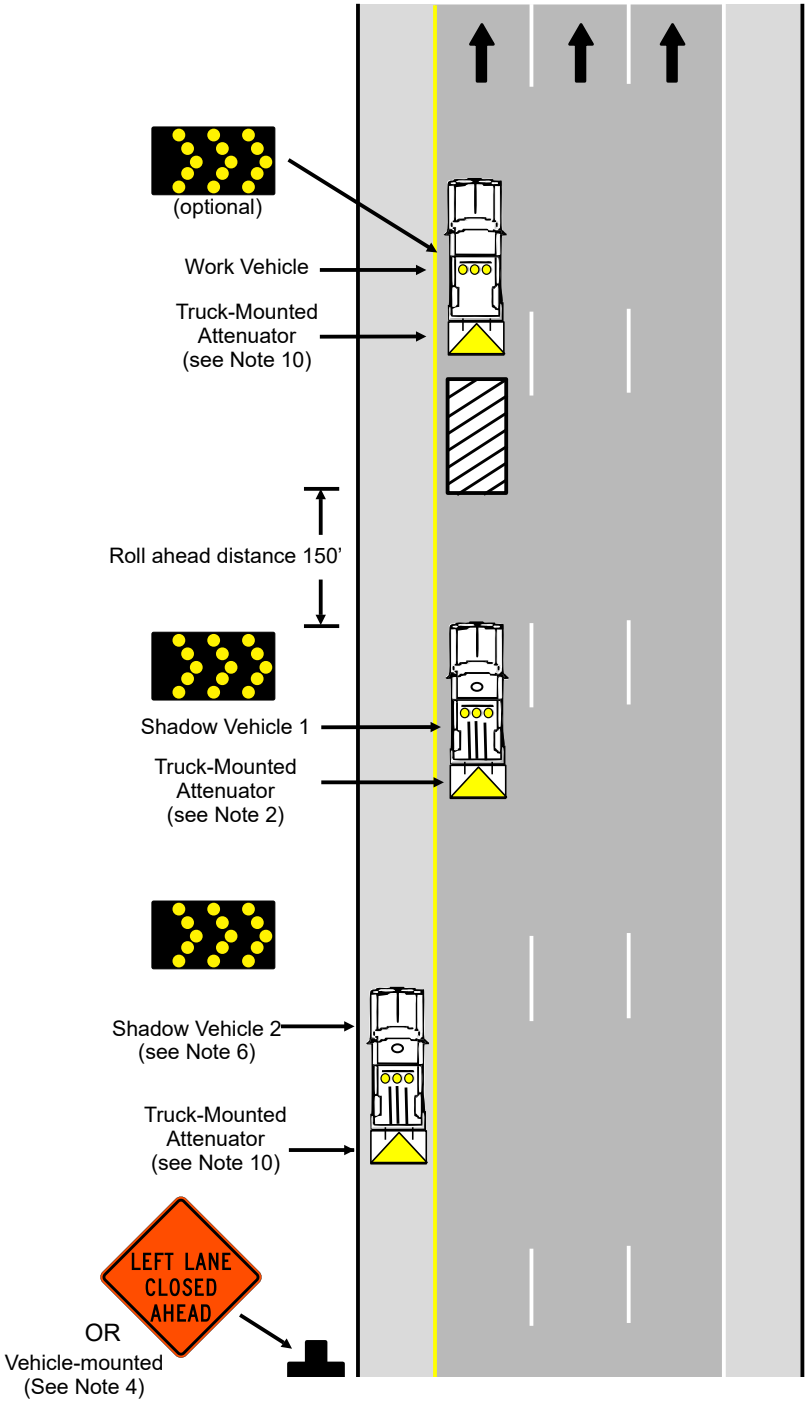


Figure 10: Mobile operation on a multi-lane road

Notes for Figure 11
Lane Closure on a Multi-Lane Road
Using a Flagger Without Reduced Speed

1. **A flagger may be used at the work zone to warn traffic. This layout shall be used if a flagger is present and the speed limit is not reduced. The FLAGGER symbol sign shall be used in conjunction with the flagger positioned a minimum distance "A" and a maximum distance of 1 mile in advance of the flagger, and shall be moved ahead as work progresses.**
2. **Portable rumble strips and the RUMBLE STRIPS AHEAD sign shall be used at locations where the parameters on page 12 are met.** Portable rumble strips are not required for emergency, mobile, non-scheduled, or short-duration work. **RUMBLE STRIPS AHEAD sign shall be used in conjunction with the portable rumble strips.**
3. **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.**
4. **When a side road intersects the highway within the temporary traffic control zone, additional TTC devices shall be placed as needed.**
5. **A truck-mounted attenuator shall be used on the shadow vehicle and may be used on a work vehicle.**
6. **The arrow board shall be Type B or Type C. Type C is recommended for high-volume roads and at the beginning of a lane closure taper.**
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. A truck-mounted arrow board can be substituted for a trailer-mounted arrow board.**
8. Warning signs should be moved periodically to keep them near the mobile work area. **In those situations where the distance between the advance signs and the work is 2 to 5 miles, a Supplemental Distance plaque shall be used with the ROAD WORK AHEAD sign.** The distance between the advanced warning signs and the mobile work area should not exceed 5 miles.
9. **When the work is 2 to 5 miles ahead of the advance signs, a Road Work Next XX Miles sign or a Supplemental Distance Plaque shall be used.** The distance between the advanced warning signs and the work area should not exceed 5 miles.
10. 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.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000	1,500
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500	2,640

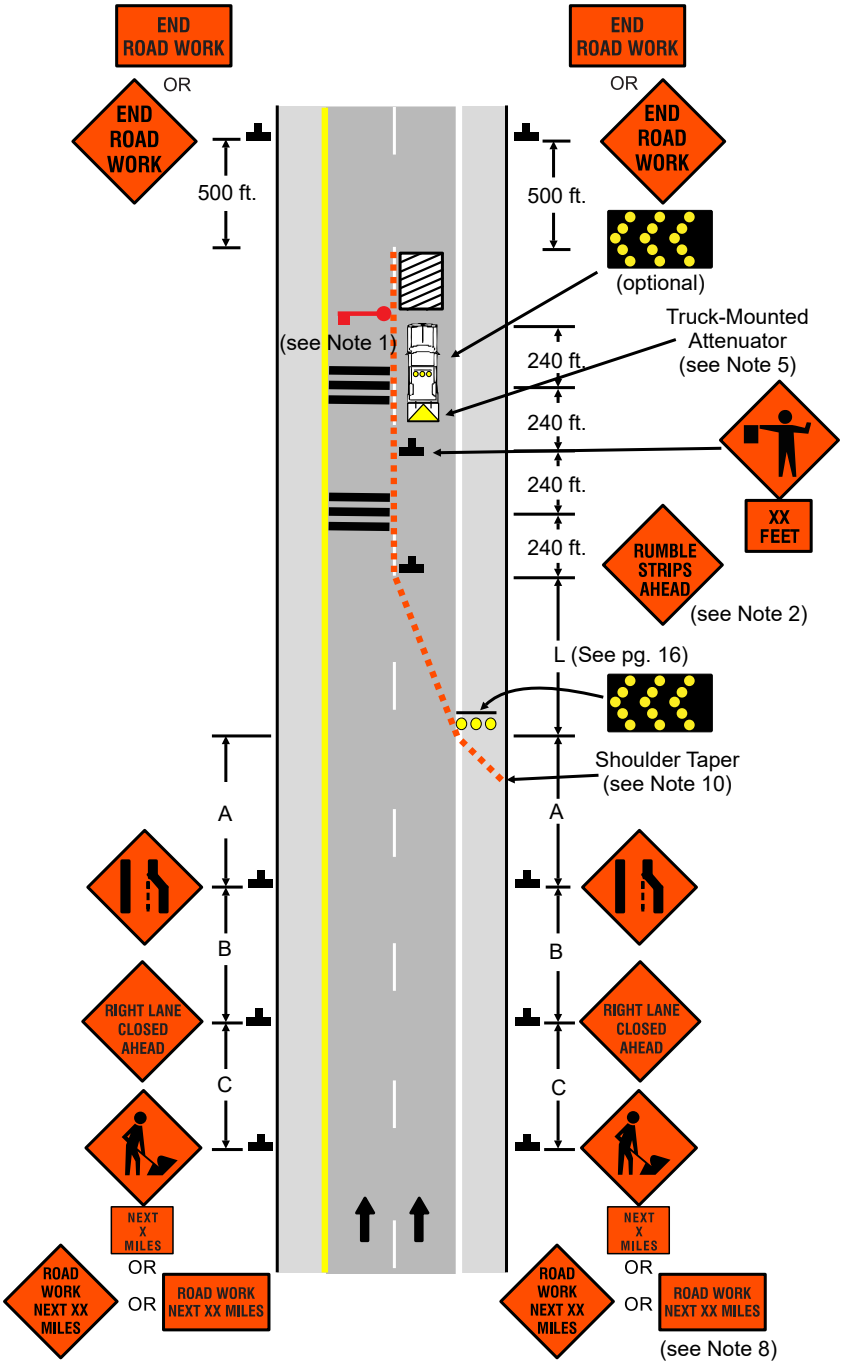


Figure 11: Lane closure on a multi-lane road using a flagger without reduced speed

Notes for Figure 12
Lane Closure on a Multi-Lane Road
Using a Flagger With Reduced Speed

1. **The notes for Figure 11 shall also apply to Figure 12**.
2. **A flagger may be used at the work zone to warn traffic. This layout shall be used if a flagger is present and the speed limit is reduced. The FLAGGER symbol sign shall be used in conjunction with the flagger positioned a minimum distance "A" and a maximum distance of 1 mile in advance of the flagger, and shall be moved ahead as work progresses.**
3. **SPEED LIMIT signs shall be 36" x 48" in size. Speed limits can be reduced in increments of no more than 30 mph. A MINIMUM FEE $80 plate shall be attached below the reduced SPEED LIMIT sign. Existing speed limit signs within a reduced speed zone shall be covered.** REDUCED SPEED AHEAD signs should be W3-5 and 48" x 48". **The speed limit shall be reestablished "½ A" after the end of the project limits.**
4. SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT sign is not required if the work is less than 15 days. If the sign is used, position the sign "C" in advance of the ROAD WORK AHEAD sign.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000	1,500
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500	2,640

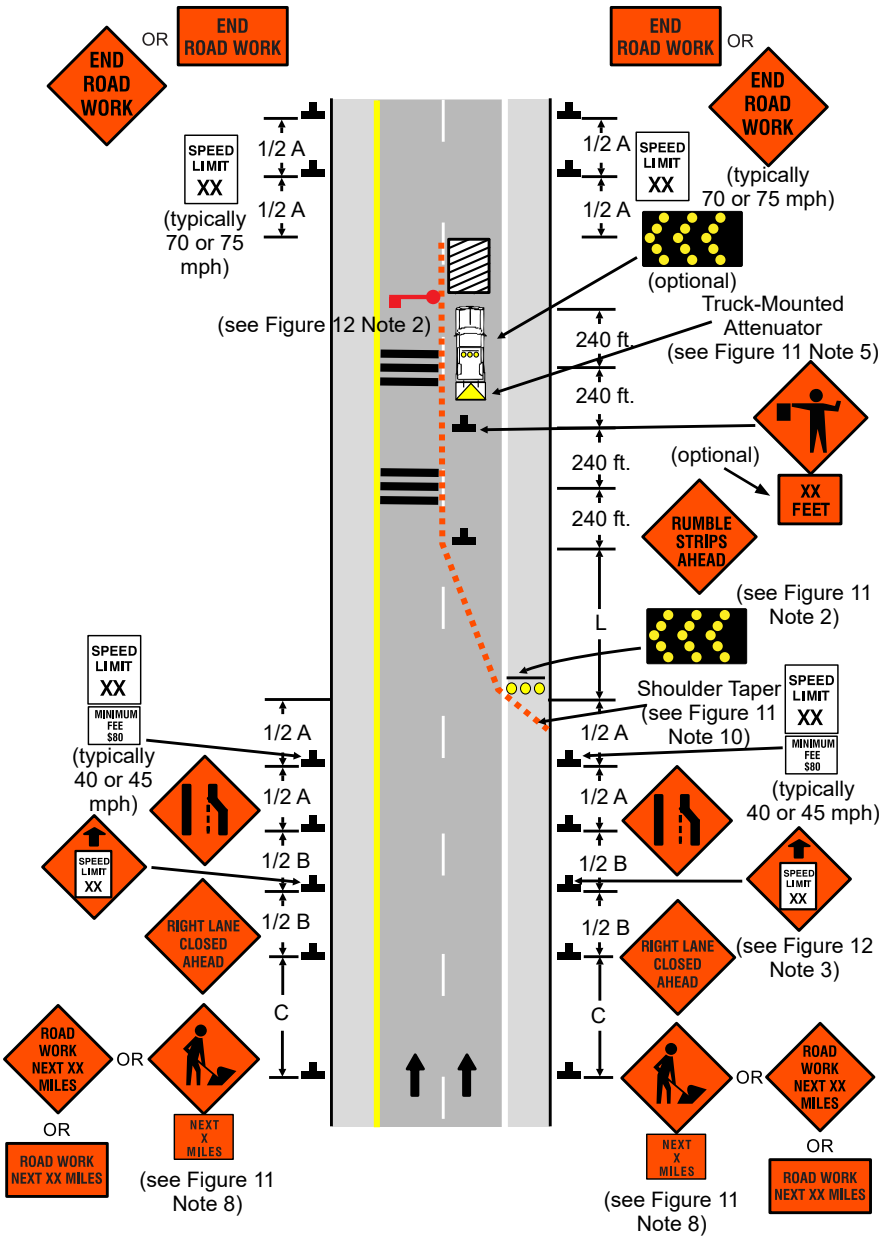


Figure 12: Lane closure on a multi-lane road using a flagger with reduced speed

Notes for Figure 13
Lane Closure on a Multi-Lane Road
Not Using a Flagger Without Reduced Speed

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 temporary traffic control zone, additional TTC devices shall be placed as needed.**
3. **A truck-mounted attenuator shall be used on the shadow vehicle and may be used on a work vehicle.**
4. **The arrow board shall be Type B or Type C. Type C is recommended for high-volume roads and at the beginning of a lane closure taper.**
5. **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. A truck-mounted arrow board can be substituted for a trailer-mounted arrow board.**
6. **When the work is 2 to 5 miles ahead of the advance signs, a Road Work Next XX Miles sign or a Supplemental Distance Plaque shall be used.** The distance between the advanced warning signs and the work area should not exceed 5 miles. Road work ahead sign may be used instead of the Symbolic sign.
7. 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.
8. If the roadway is undivided, the left-hand signs are omitted.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000	1,500
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500	2,640

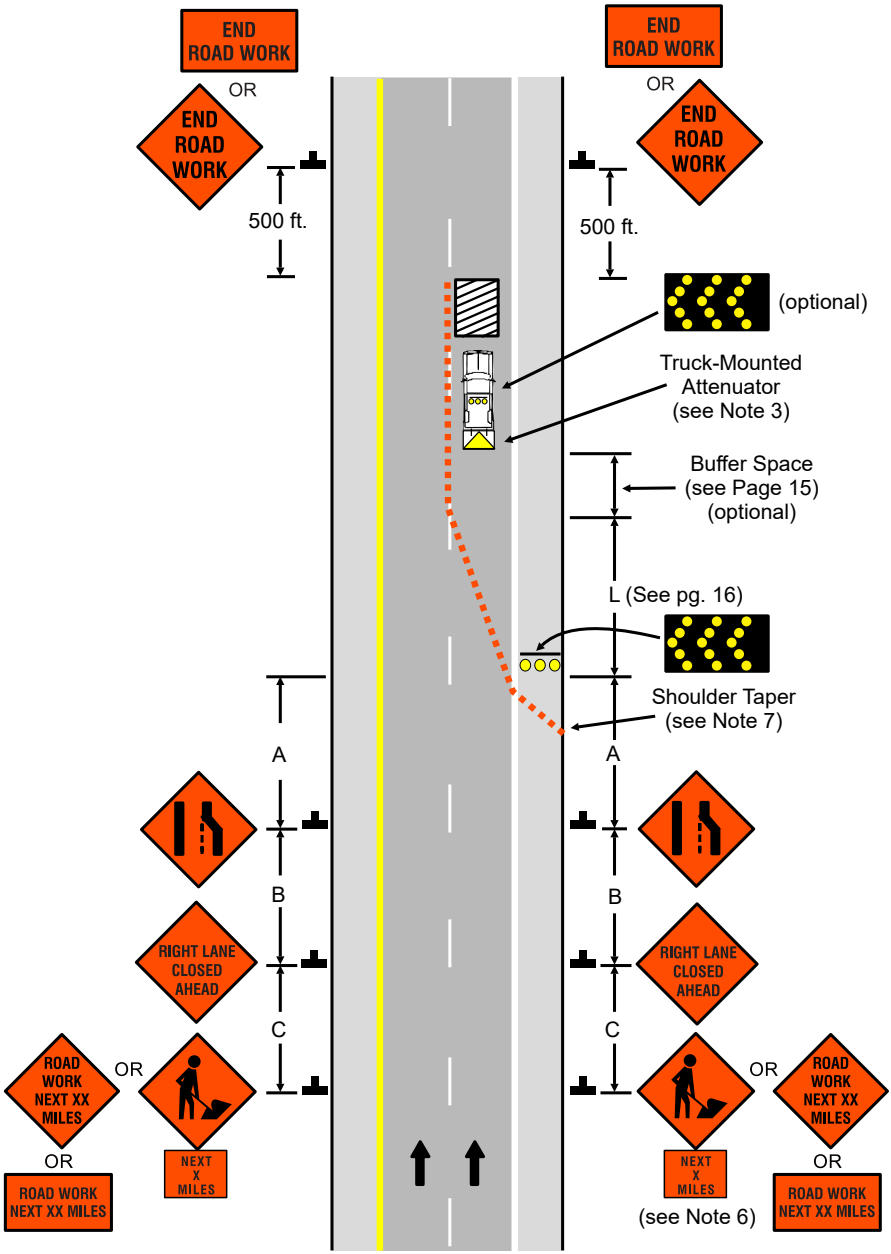


Figure 13: Lane closure on a multi-lane road not using a flagger without reduced speed

Notes for Figure 14
Lane Closure on a Multi-Lane Road
Not Using a Flagger With Reduced Speed

1. **The notes for Figure 13 shall also apply to Figure 14.**
2. **SPEED LIMIT signs shall be 36" x 48" in size. Speed limits can be reduced in increments of no more than 30 mph. A MINIMUM FEE $80 plate shall be attached below the reduced SPEED LIMIT sign. Existing speed limit signs within a reduced speed zone shall be covered.** REDUCED SPEED AHEAD signs should be W3-5 and 48" x 48". **The speed limit shall be reestablished "½ A" after the end of the project limits.**
3. SPEED LIMIT ENFORCED - MINIMUM FEE $80 WHEN WORKERS PRESENT sign is not required if the work is less than 15 days. If the sign is used, position the sign "C" in advance of the ROAD WORK AHEAD sign.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000	1,500
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500	2,640

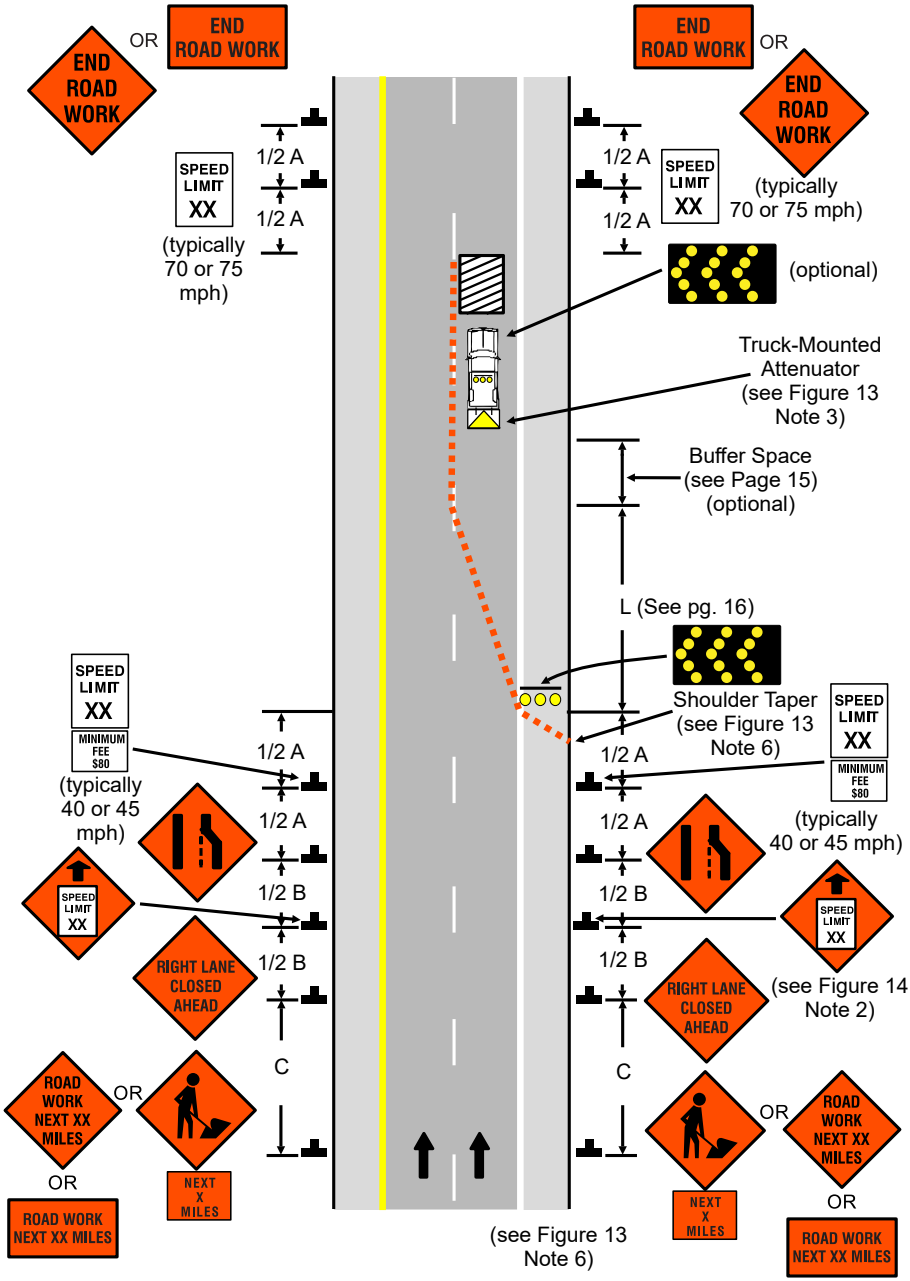


Figure 14: Lane closure on a multi-lane road not using a flagger with reduced speed

Notes for Figure 15
Double Lane Closure on a Multi-Lane Road

1. **A truck-mounted attenuator shall be used on the shadow vehicle and may be used on a work vehicle.**
2. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane. A truck-mounted arrow board can be substituted for a trailer-mounted arrow board.**
3. 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).
4. If a paved shoulder having a minimum width of 10 feet and sufficient strength is available, the left and adjacent interior lanes may be closed and vehicular traffic carried around the work space on the right 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.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000	1,500
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500	2,640

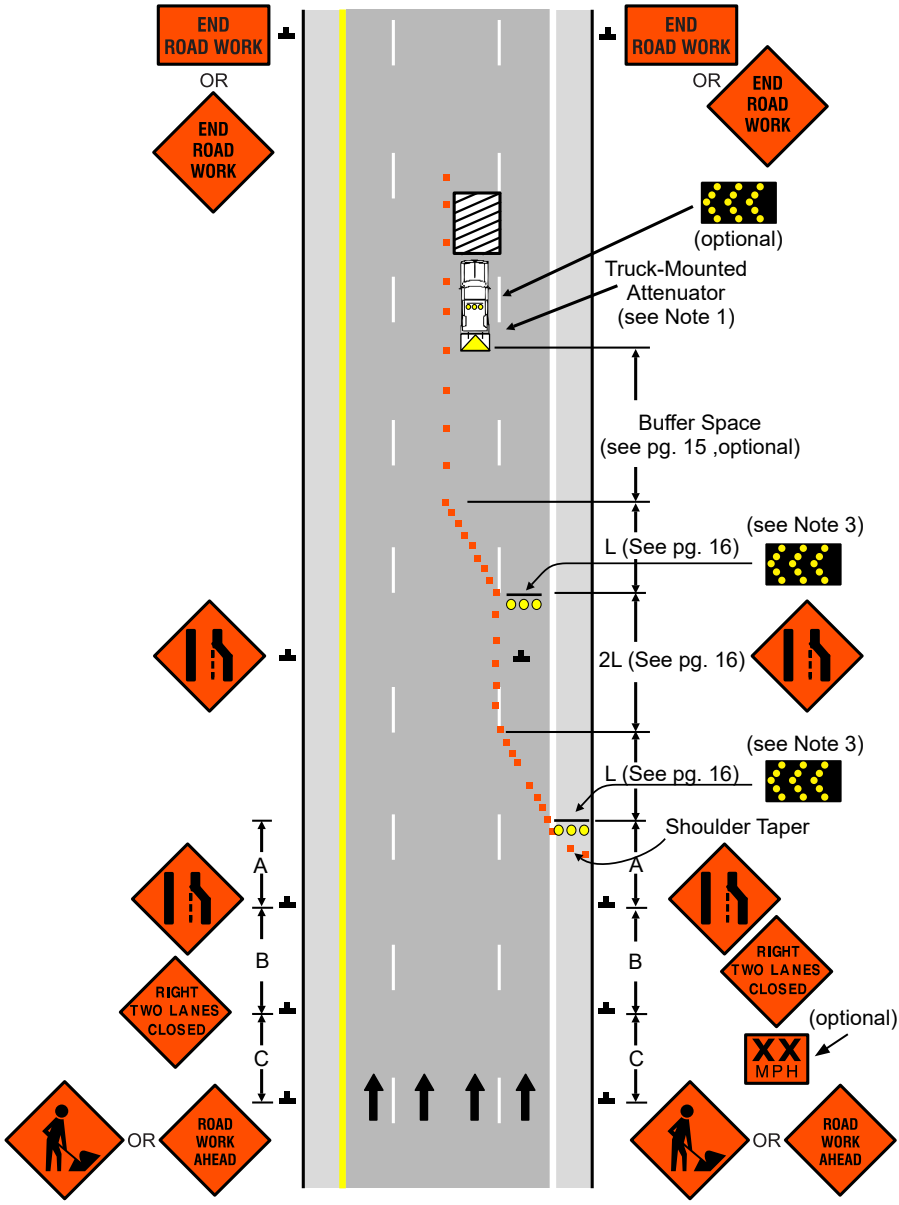


Figure 15: Double Lane closure on a multi-lane road

Notes for Figure 16
Work in the Vicinity of a Highway-Rail Grade Crossing

1. **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 4), even if automatic warning devices are in place.**
2. **When work, which includes placing traffic control, is being done within 25 feet of railroad, the procedure on pages 52-53 shall be followed.**
3. **Portable rumble strips shall be used at locations where the parameters on page 12 are met.** Portable rumble strips are not required for emergency, mobile, non-scheduled, or short-duration work. **RUMBLE STRIPS AHEAD sign shall be used in conjunction with the portable rumble strips.**
4. 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 15 feet on either side of the closest and farthest rail.
5. 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.
6. The DO NOT STOP ON TRACKS sign should be used on all approaches to a highway-rail grade crossing within the limits of a work zone.
7. Pilot car may be used see page 11.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Rural	500	500	500

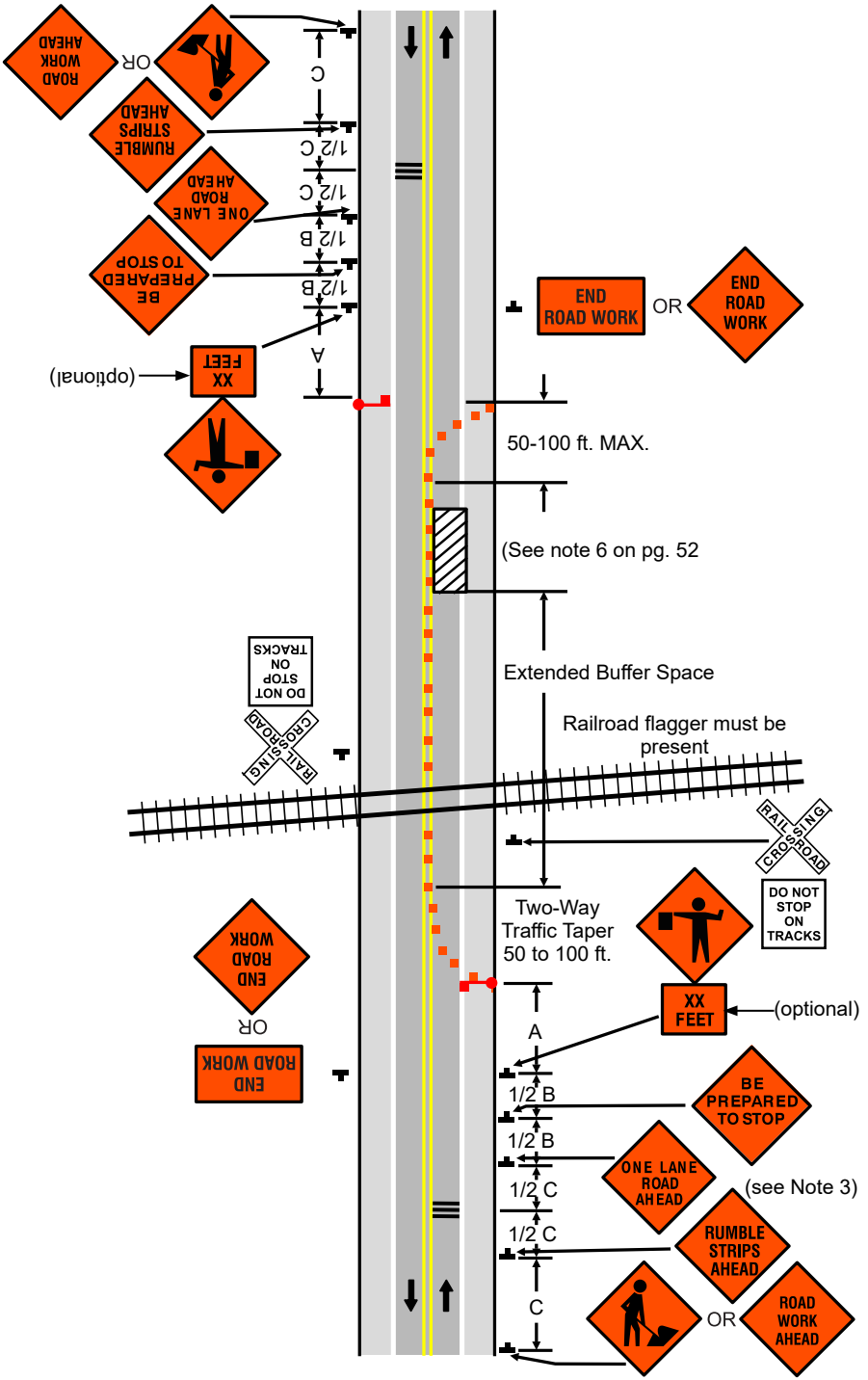


Figure 16: Work in the vicinity of a highway-rail grade crossing

Procedures for Maintenance Activities in the Vicinity of Railroad Crossings

1. These notes apply to mobile, short duration, and stationary operations.
2. When work is being done within 25 feet of a railroad crossing, a railroad flagger must be present. In such case, District Administration should contact the Road Master of the respective Railroad (2 weeks in advance) to coordinate the maintenance activities.
3. When contacting the Road Master of the respective Railroad, it is important to include the crossing number. Each public highway-rail crossing has an individual crossing number. Crossings are referenced by this number or railroad milepost number. Railroads are required to have the crossing number posted at the crossing.
4. Signalized crossings have the number posted on the outside of a small structure, called a bungalow, which is normally near one of the signals. The name of the railroad and a phone number will be posted with the crossing number and milepost. Example: (DOT 093311A MP 329.5)
5. Crossings that do not have signals normally have the crossing number fastened to one of the crossbuck posts.
6. The diagram illustrates work occurring in the lane; however, work may also take place on the shoulder or roadside. Adjust signage, channelizing devices, and traffic control measures accordingly to ensure proper warning and guidance for road users.

North Dakota Railroad
Contact List

Railroad Authority

Burlington Northern Santa Fe (BNSF)
* 800-832-5452

Canadian Pacific/Soo Line (CPR)
* 800-716-9132

Dakota Missouri Valley & Western (DMVW)
Troy Fast..... 701-471-3435

Dakota Northern (DNRR)
Jason Bierworth..... 701-741-6068

Northern Plains Railroad (NPR)
Jerry Hegstrom 701-330-8022

Red River Valley & Western (RRVW)
Jamie Martin..... 218-643-1532

* BNSF and CPR calls are routed for immediate response by the dispatcher. No names are available.

Notes for Figure 17
Work on the Roadway with a Roundabout

1. **Each approaching leg of the roundabout shall have a flagger. The flagger symbol sign shall be used in conjunction with the flaggers, positioned a minimum distance of "A" and a maximum distance of 1,000 feet in advance of the flagger. The BE PREPARED TO STOP sign shall also be used, positioned a minimum of "½ B" in advance of the FLAGGER symbol sign.**
2. **At night, flagger stations shall be illuminated, except in emergencies.**
3. **Portable rumble strips shall be used at locations where the parameters on page 12 are met.** Portable rumble strips are not required for emergency, mobile, non-scheduled, or short-duration work. **RUMBLE STRIPS AHEAD sign shall be used in conjunction with the portable rumble strips. If portable rumble strips are not used, position the ROAD WORK AHEAD sign a minimum of "C" in advance of the ONE LANE ROAD AHEAD sign.**
4. **Where a quadrant of the circular intersection is closed, only one direction of approach traffic shall be released at a time.**
5. The ROAD WORK AHEAD and the END ROAD WORK signs may be omitted for short-duration operations per leg of a roundabout.
6. Consult your district traffic control specialist for guidance when more complex situations are needed.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Rural	500	500	500

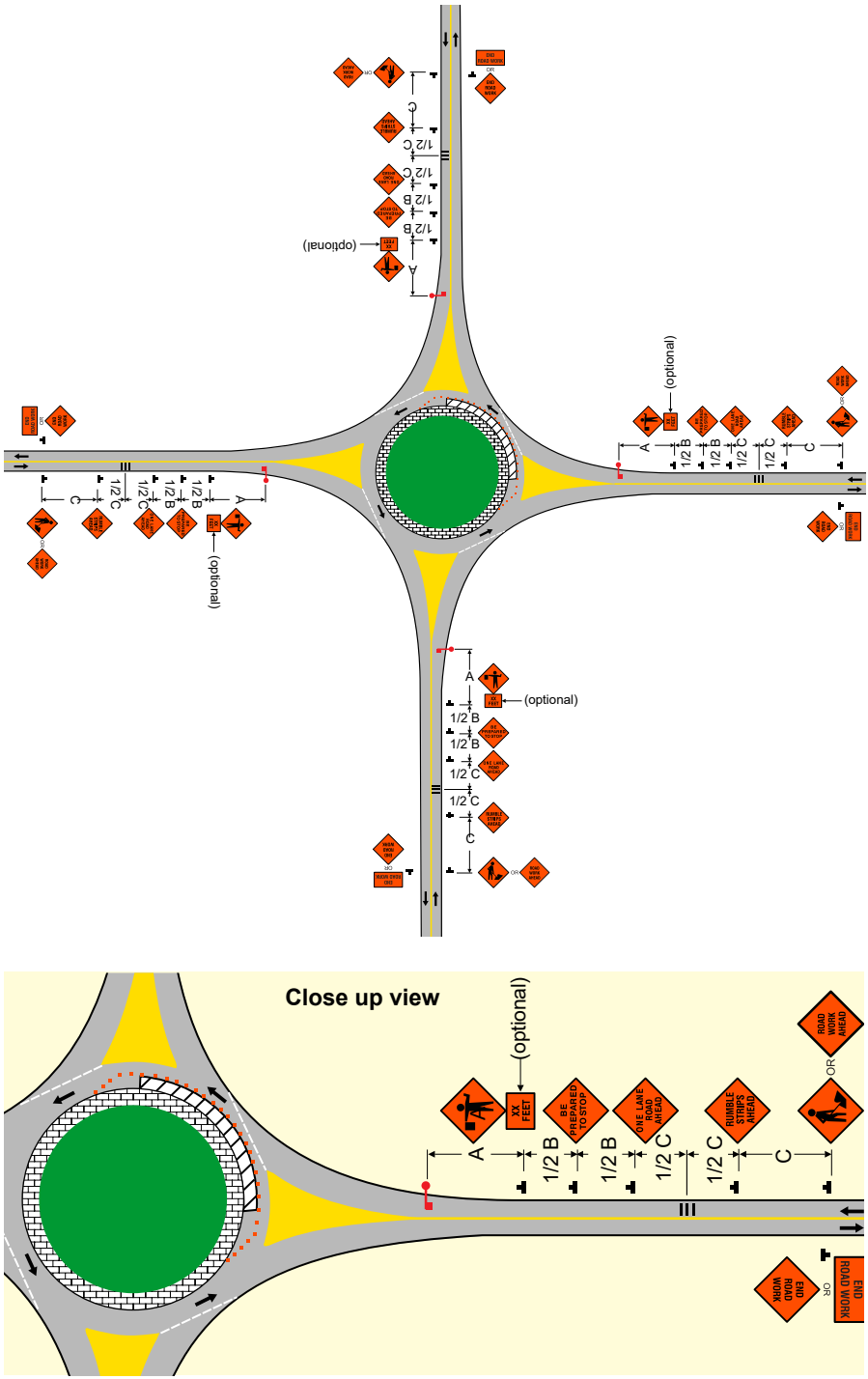


Figure 17: Work on the Roadway with a Roundabout

Notes for Figure 18
Work in the Vicinity of an Exit Ramp

1. **A temporary EXIT sign shall be located in the temporary gore.**
2. **The temporary EXIT sign placed in the temporary gore shall be black on orange.**
3. **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.**
4. This layout applies to work in the vicinity of an exit ramp on all multi-lane roads.
5. Consult your district traffic control specialist for guidance when more complex situations are needed.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000	1,500
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500	2,640

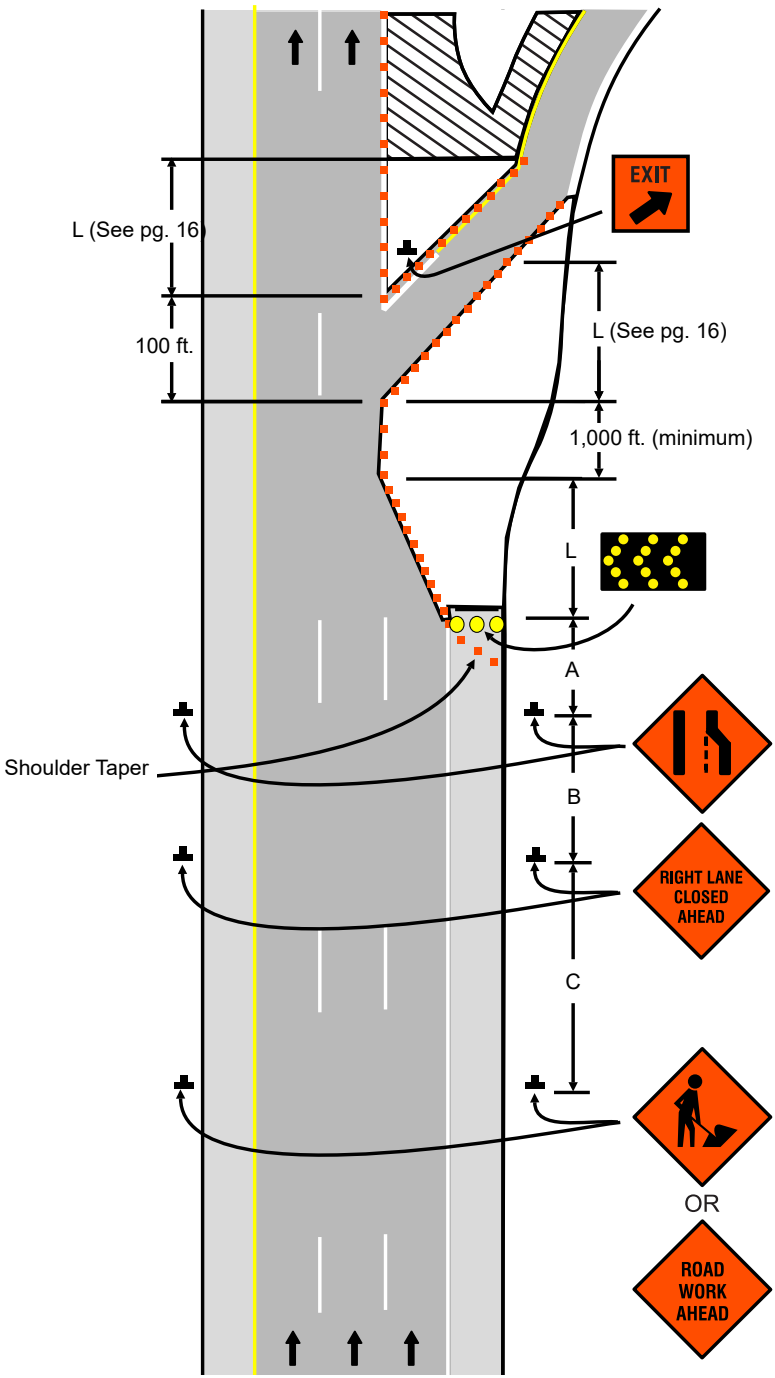


Figure 18: Work in the vicinity of an exit ramp

Notes for Figure 19
Partial Ramp Closure

1. Ramp work for on-ramps requires the same traffic control devices as the situation shown.

Road Type	Distance (ft.)	
	A (min.)	B (min.)
Urban - Low Speed (40 mph of less)	100	100
Urban - High Speed (greater than 40 mph)	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500

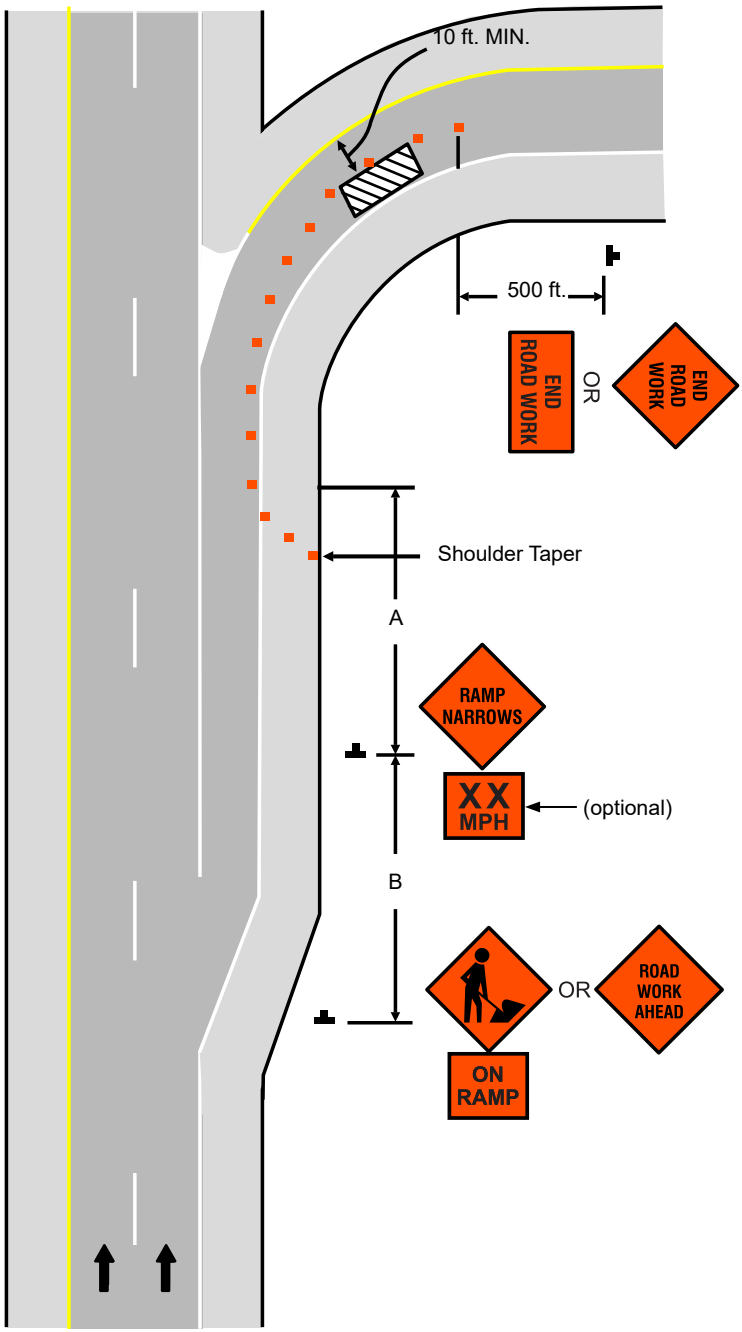


Figure 19: Partial ramp closure

Notes for Figure 20
Work in the Vicinity of an Entrance Ramp - Merge Required

1. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**
2. The mainline merging taper with the arrow board at its starting point should be located sufficiently in advance so that the arrow board is not confusing to drivers on the entrance ramp.
3. **For the information shown on the diagram on the right-hand side of the typical application, where inadequate acceleration distance exists for the temporary entrance, the YIELD sign and YIELD ahead sign shall be replaced with STOP sign and STOP ahead sign.** When used, the YIELD or STOP sign should be located so that ramp vehicular traffic has adequate sight distance of oncoming mainline vehicular traffic to select an acceptable gap in the mainline vehicular traffic flow.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000	1,500
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500	2,640

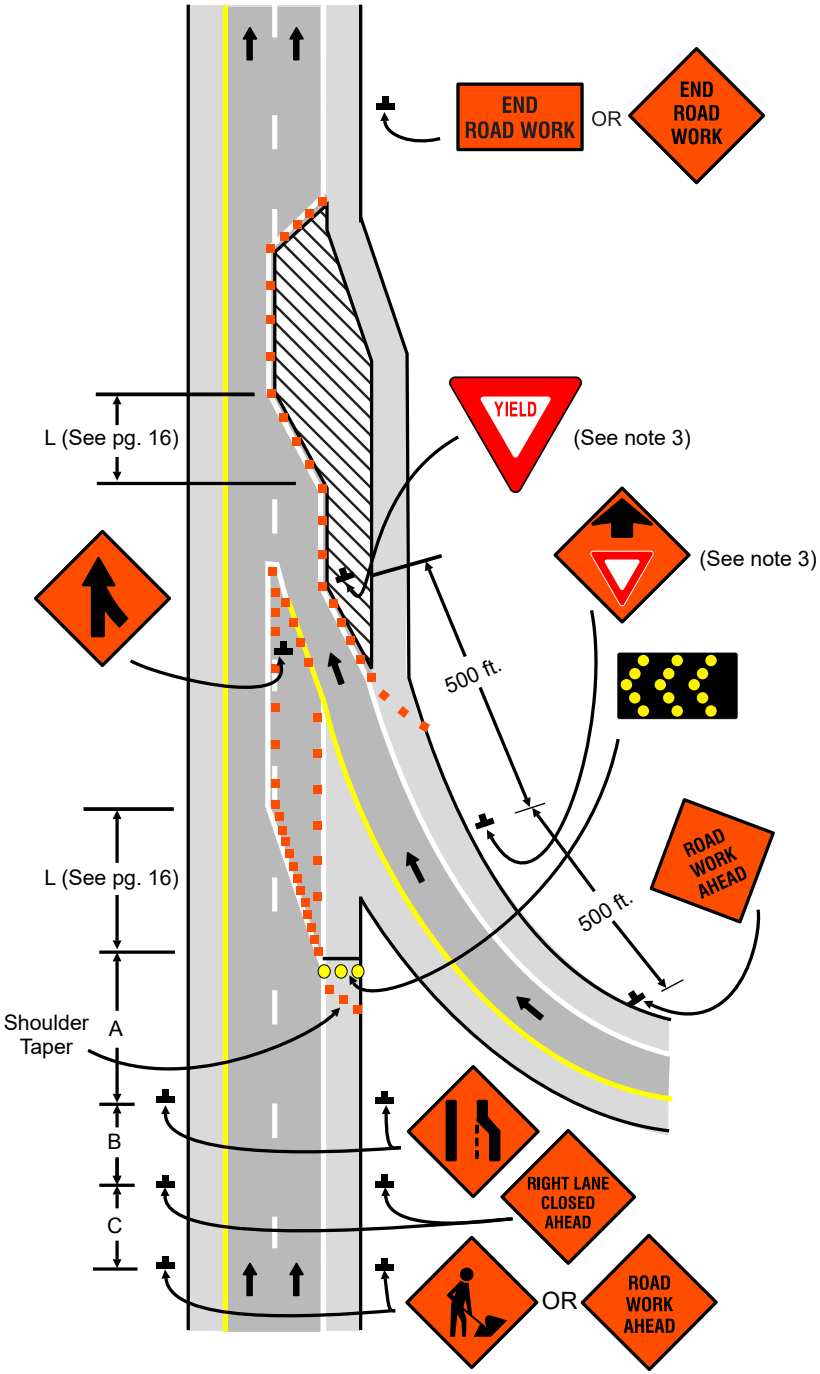


Figure 20: Work in vicinity of an entrance ramp - merge required

Notes for Figure 21
Work in the Vicinity of an Entrance Ramp - Added Lane

1. **An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.**
2. **A truck-mounted attenuator shall be used on the shadow vehicle and may be used on a work vehicle.**
3. An acceleration lane of sufficient length should be provided whenever possible as shown in the figure.
4. The mainline merging taper with the arrow board at its starting point should be located sufficiently in advance so that the arrow board is not confusing to drivers on the entrance ramp.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000	1,500
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500	2,640

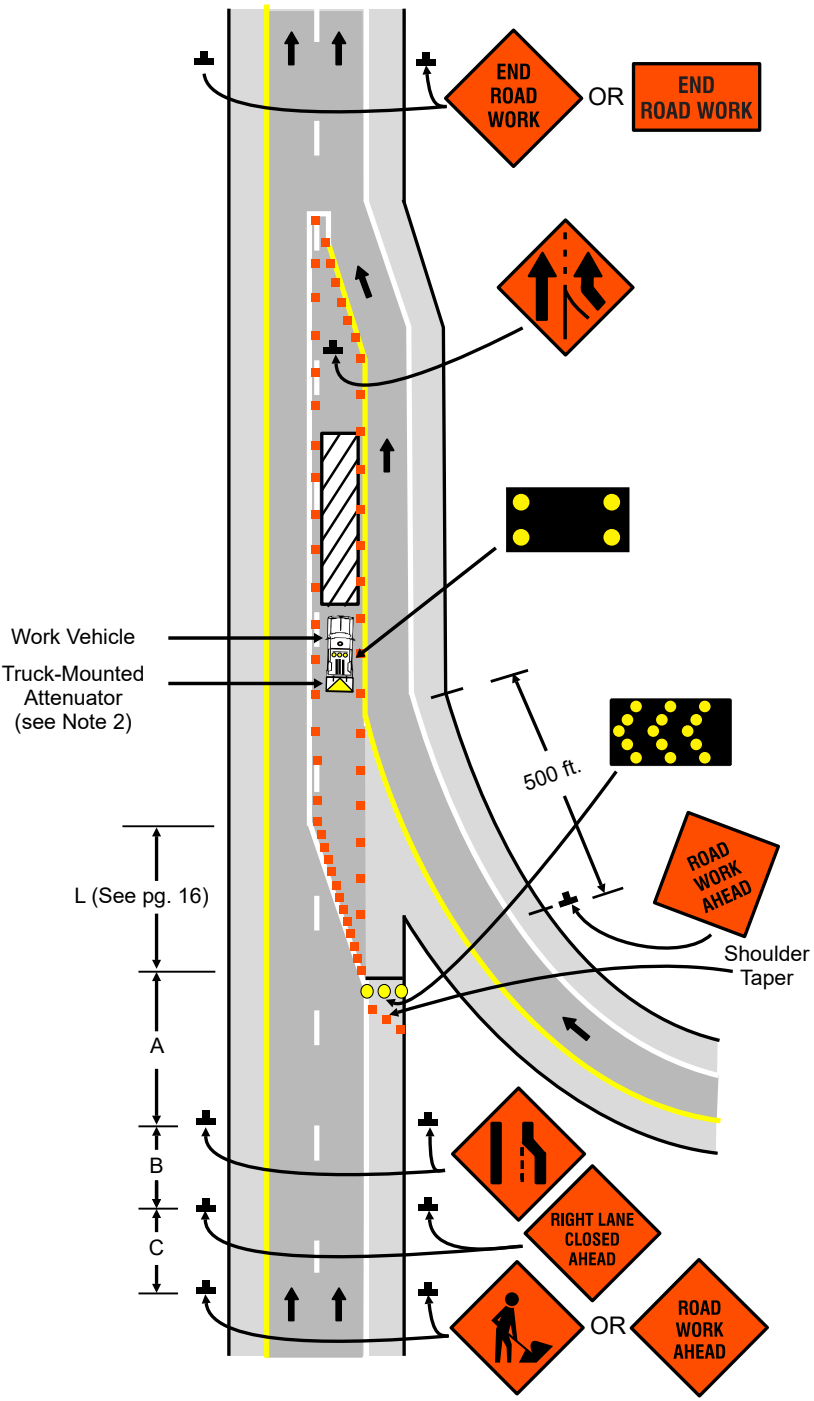


Figure 21: Work in vicinity of an entrance ramp - added lane

Notes for Figure 22
Road Closure With Ramp Detour

1. If there is an existing STOP sign at the end of the exit ramp, the STOP sign may be left in place and uncovered. **If the STOP sign at the end of the exit ramp is covered to not stop traffic from the closed road, flaggers shall be present on the intersecting road. Use on the intersecting road the information illustrated in Figure 8 or 9 for a two-lane road and Figure 11 or 12 for a multi-lane road.**
2. **If the road will be closed for longer than short-duration or at night, a ROAD CLOSED sign and Type 3 barricades shall be put in place on the closed road after the exit ramp.**
3. **SPEED LIMIT signs shall be 36" x 48" in size. Speed limits can be reduced in increments of no more than 30 mph. A MINIMUM FEE $80 plate shall be attached below the reduced SPEED LIMIT sign. Existing speed limit signs within a reduced speed zone shall be covered.**
4. **A SPEED LIMIT 25 sign shall be placed at the midpoint of the exit ramp.**
5. A Type C arrow board is recommended to be used at the beginning of the taper.

Road Type	Distance (ft.)		
	A (min.)	B (min.)	C (min.)
Urban - Low Speed (40 mph of less)	100	100	100
Urban - High Speed (greater than 40 mph)	350	350	350
Urban Expressway/Freeway (60 mph or less)	750	1,000	1,500
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500	2,640

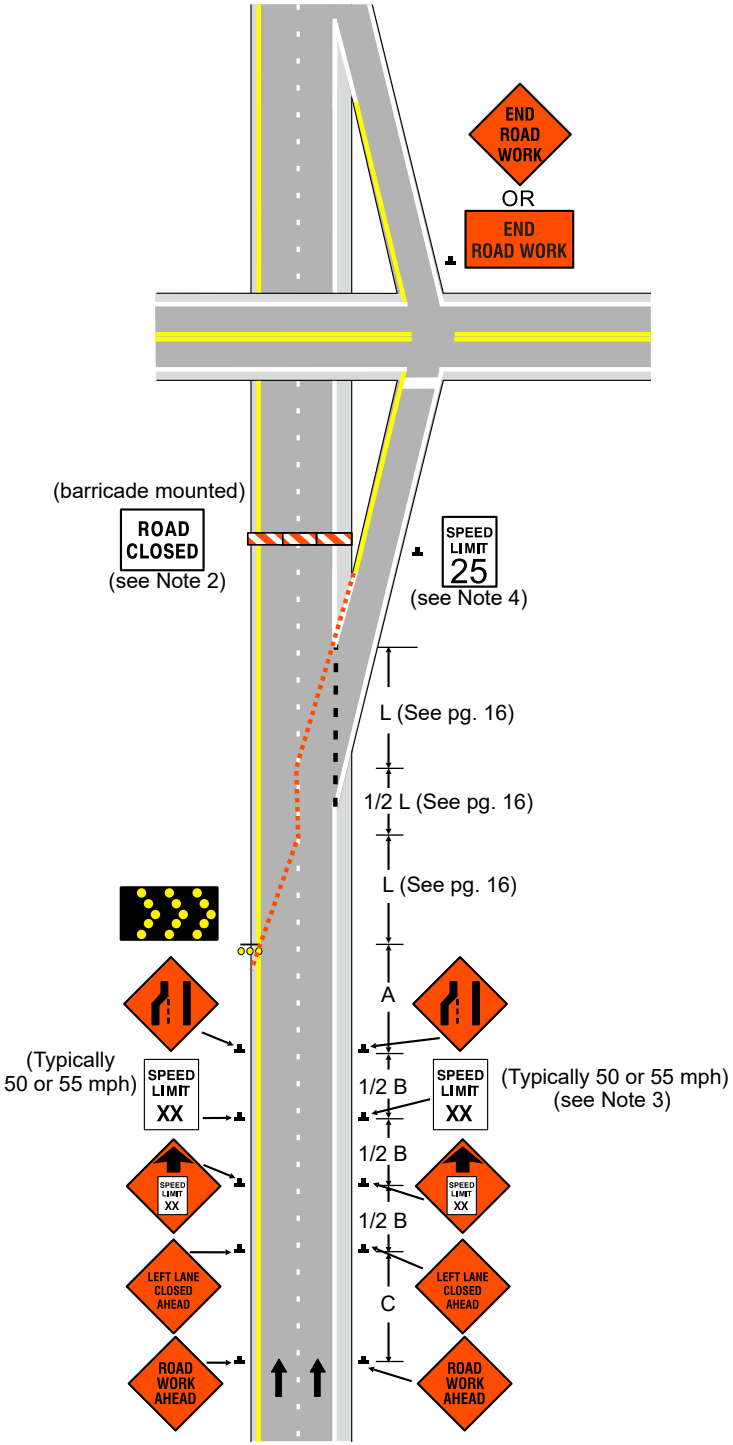


Figure 22: Road closure with ramp detour

Notes for Figure 23
Road Closure With Detour

1. If the road is opened for some distance beyond the intersection and/or there are significant origin/destination points beyond the intersection, the ROAD CLOSED and DETOUR signs on Type 3 barricades may be located at the edge of the traveled way.
2. 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.
3. Flashing warning lights and/or flags may be used to call attention to the advance warning signs and Type 3 barricades. Red flashing lights may be used at the work zone on Type 3 barricades.
4. Cardinal direction plaques may be used with route signs.
5. A flagger may be used to warn and guide road users, positioned in advance of the closure at the intersection of the detour.
6. For multi-lane roads, a matching set of advance warning signs should also be placed on the left-hand side of the directional roadway, or you may refer to the MUTCD or NDDOT Standard Drawings for additional guidance.

Road Type	Distance (ft.)	
	A (min.)	B (min.)
Urban - Low Speed (40 mph of less)	100	100
Urban - High Speed (greater than 40 mph)	350	350
Rural	500	500
Urban Expressway/Freeway (60 mph or less)	750	1,000
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500

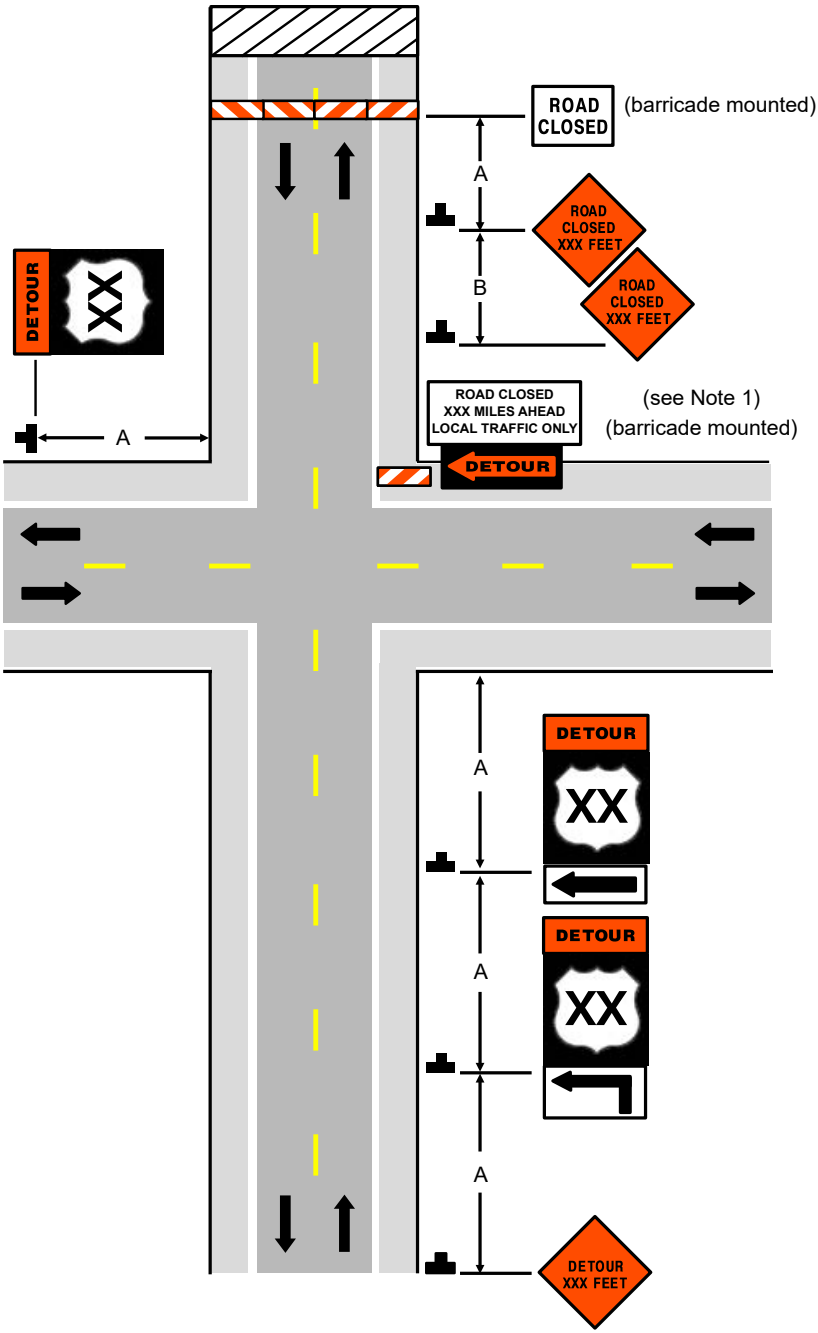


Figure 23: Road closure with detour
(see Note 6 for multi-lane roads)

Notes for Figure 24
Road Closure Without Detour

1. 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 on Type 3 barricades may be located at the edge of the traveled way.
2. Flashing warning lights and/or flags may be used to call attention to the advance warning signs and Type 3 barricades. Red flashing lights may be used at the work zone on the Type 3 barricades.
3. A flagger may be used to warn and guide road users, positioned in dvance of the closure at the intersection of the detour.
4. For multi-lane roads, a matching set of advance warning signs should also be placed on the left-hand side of the directional roadway, or you may refer to the MUTCD or NDDOT Standard Drawings for additional guidance.

Road Type	Distance (ft.)	
	A (min.)	B (min.)
Urban - Low Speed (40 mph of less)	100	100
Urban - High Speed (greater than 40 mph)	350	350
Rural	500	500
Urban Expressway/Freeway (60 mph or less)	750	1,000
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500

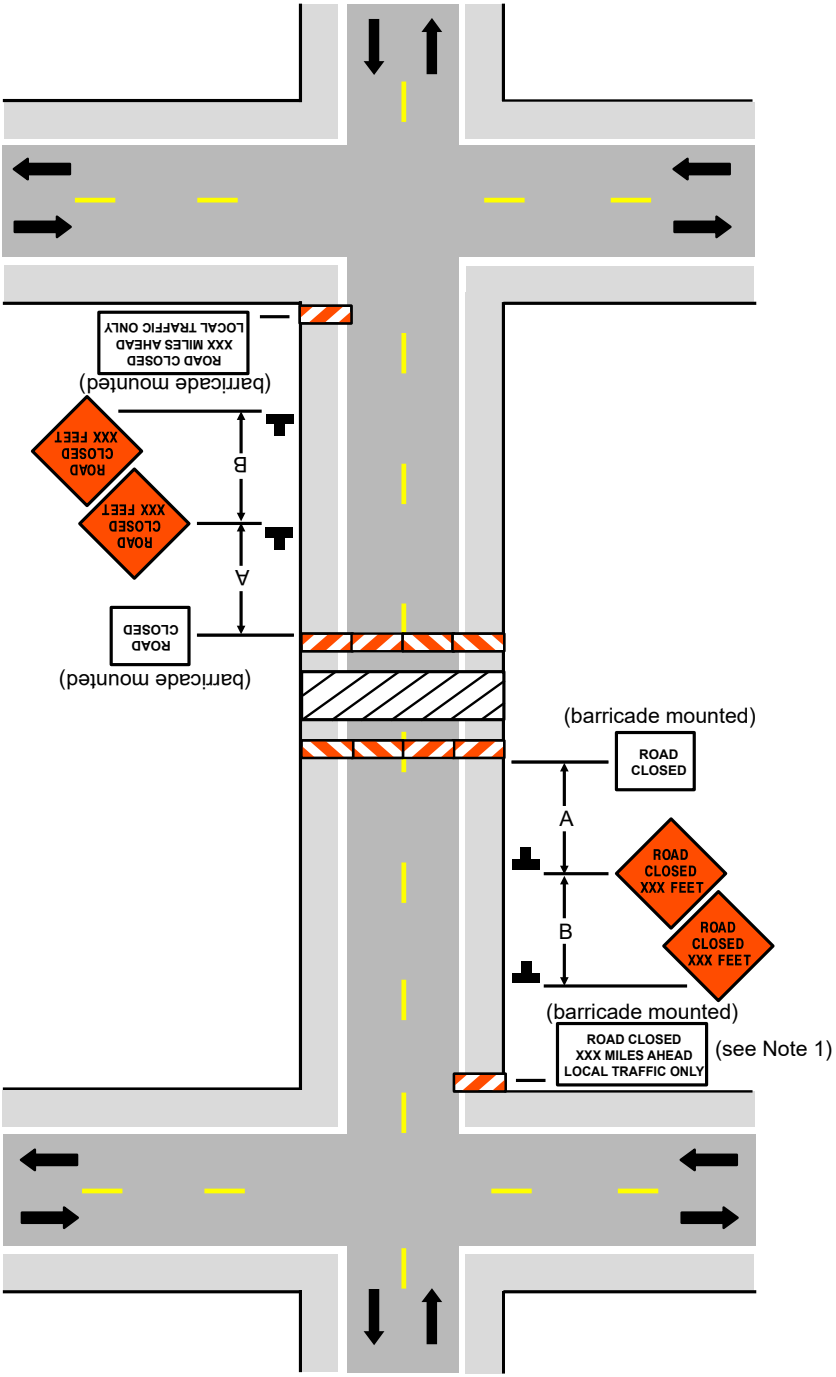


Figure 24: Road closure without detour
(see Note 4 for multi-lane roads)

Notes for Figure 25
Surveying Along the Centerline of a Road
With Low Traffic Volumes

1. **For surveying on the centerline of a high-volume two-lane road or multi-lane road, one or two lanes shall be closed. Use the information illustrated in Figure 8 or 9 for a high-volume two-lane road and Figure 11, 12, 13, 14, or 15 for a multi-lane road. Lane closures are recommended for low sight-distance roadways.**
2. Channelizing devices should be placed 6 to 12 inches on either side of the centerline. **Channelizing device spacing in tapers shall be a maximum of the distance in feet of the speed limit in mph ("S"). Channelizing device spacing in channelization shall be a maximum of twice the distance in feet of the speed limit in mph ("2S").**
3. **Portable rumble strips shall be used at locations where the parameters on page 12 are met.** Portable rumble strips are not required for emergency, mobile, non-scheduled, or short-duration work. **RUMBLE STRIPS AHEAD sign shall be used in conjunction with the portable rumble strips.**
4. Flaggers should be used to warn workers who cannot watch road users. **The FLAGGER symbol sign and the BE PREPARED TO STOP sign shall be used in conjunction with the flaggers. If flaggers and portable rumble strips are not used, the SURVEY CREW AHEAD sign shall be positioned a minimum of "B" in advance of the SURVEY CREW sign.**
5. The survey area should be no more than two miles in length in rural areas and no more than one mile in length in urban areas.
6. For a survey along the edge of the road or along the shoulder, cones may be placed along the edge line.
7. Channelizing devices may be omitted for a cross-section survey.
8. If the work is along the shoulder, the flaggers may be omitted.
9. ROAD WORK AHEAD signs may be used in place of the SURVEY CREW AHEAD signs.

Road Type	Distance (ft.)	
	A (min.)	B (min.)
Urban - Low Speed (40 mph of less)	100	100
Urban - High Speed (greater than 40 mph)	350	350
Rural	500	500
Urban Expressway/Freeway (60 mph or less)	750	1,000
Rural Expressway/Freeway (greater than 60 mph)	1,000	1,500

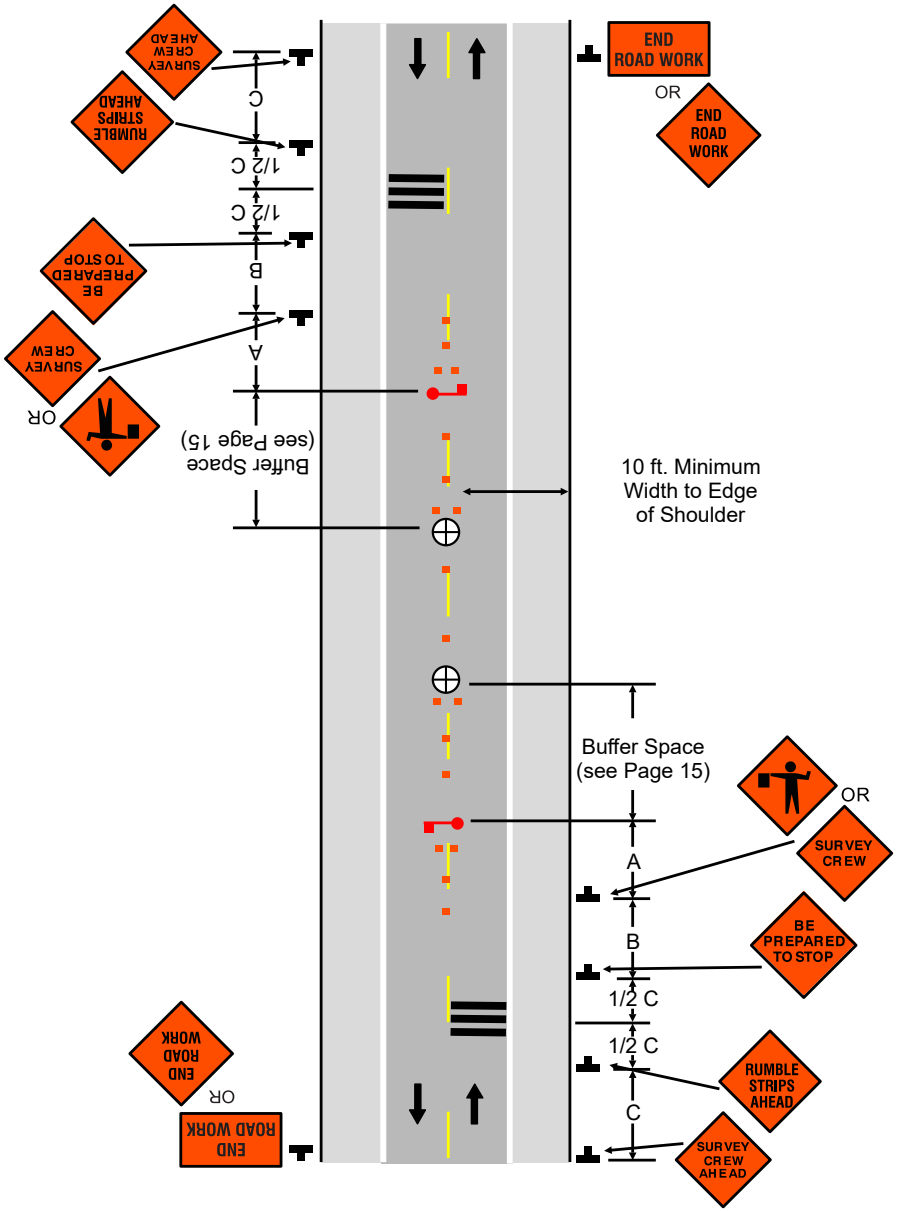


Figure 25: Surveying along the centerline of a road with low traffic volumes

Notes for Figure 26
Speed Zone for Hazards on a Two-Lane Road

1. **This layout is not in a work zone and the signs will be in place during daylight and darkness; therefore, the signs shall be reflectorized. Warning signs shall be yellow in color.**
2. **SPEED LIMIT signs shall be 36" x 48" in size. Speed limit reductions can be made in 20 mph increments. Existing speed limit signs within a reduced speed zone shall be covered. The speed limit shall be re-established 500 feet after the end of the hazard.**

   *Exact spacing to be determined in field based on length of hazard. Maximum spacing is 250 feet.

3. Layout is for one direction of travel.

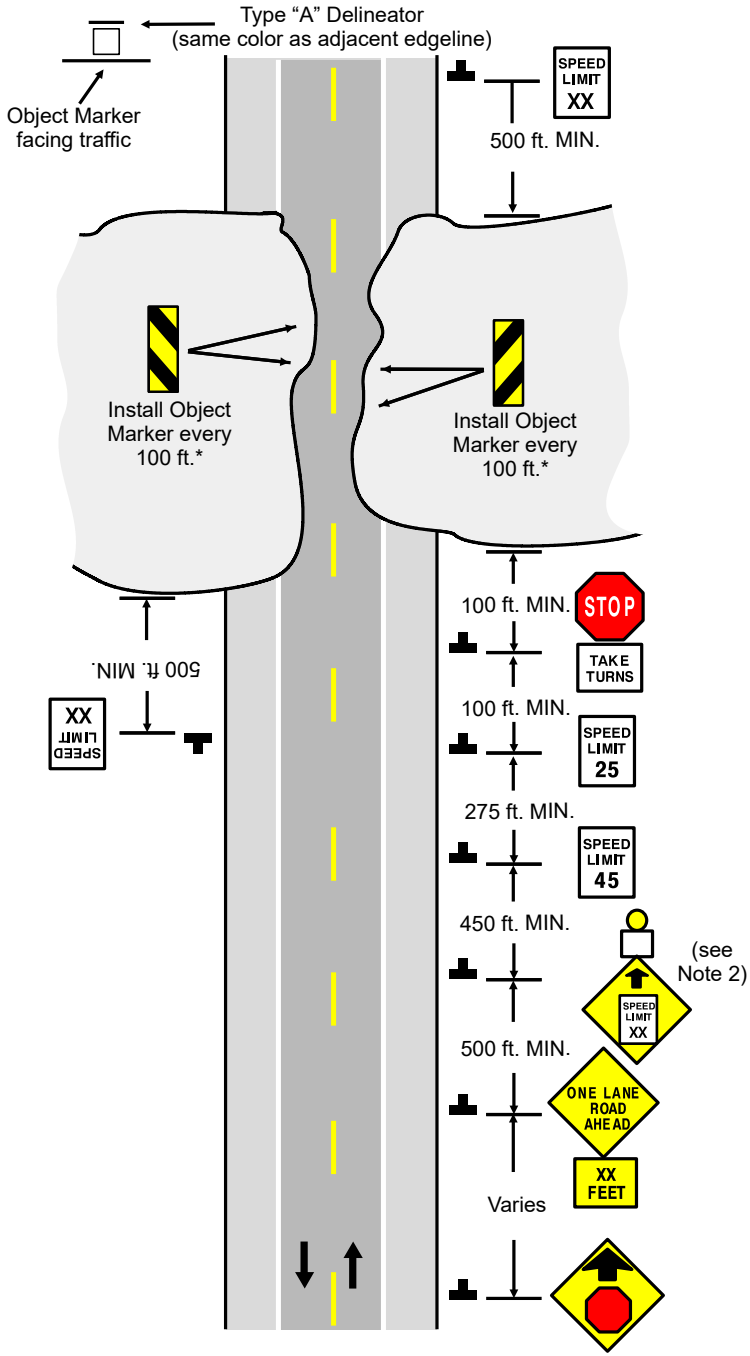


Figure 26: Speed zone for hazards on a two-lane road

Notes for Figure 27
Speed Zone for Hazards Near a Two-Lane Road

1. **This layout is not in a work zone and the signs will be in place during daylight and darkness; therefore, the signs shall be reflectorized. Warning signs shall be yellow in color.**
2. **The district shall determine the speed limit by using the following tables: the "Guidelines for Advance Placement of Warning Signs" and the "Clear Zone Table".**
3. **One of the following signs with an advisory speed limit plaque shall be used in the obstruction area: NO SHOULDER, SOFT SHOULDER, SHOULDER DROP-OFF, LOW SHOULDER, or MATERIAL ON SHOULDER.** If these sign messages do not describe the condition in the field, then Maintenance Division should be contacted to design a sign layout with an appropriate message. **The signs shall have a black legend on yellow background.**
4. Layout is for one direction of travel.

*Exact spacing to be determined in field based on length of hazard. Maximum spacing is 250 feet.

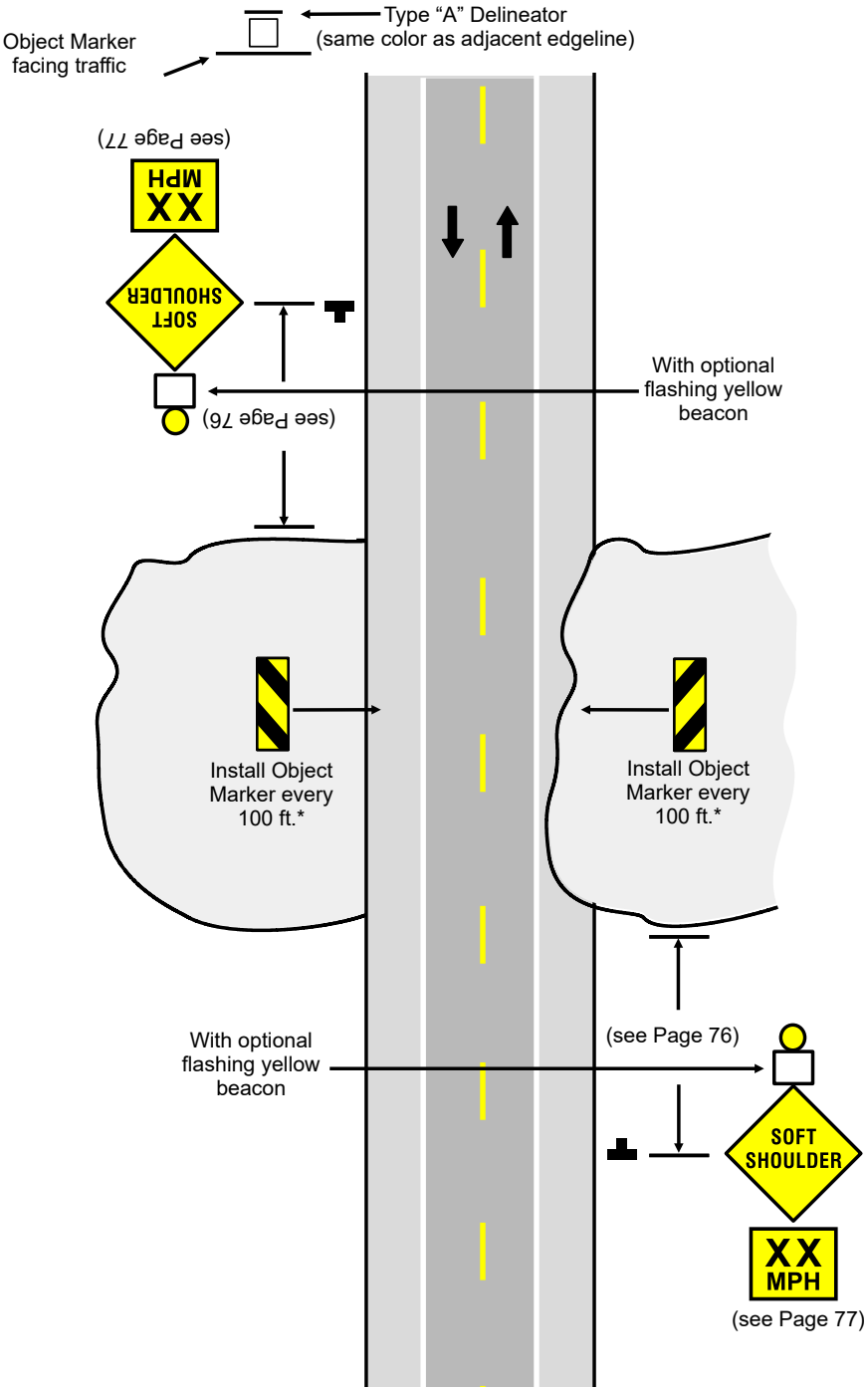


Figure 27: Speed zone for hazards near a two-lane road

Guidelines for Advance Placement of Warning Signs

Posted Speed	Deceleration to the listed advisory speed (mph) for the condition								
	25	30	35	40	45	50	55	60	65
45 mph	100 ft.	100 ft.	N/A	N/A	N/A	N/A	N/A	N/A	N/A
50 mph	150 ft.	125 ft.	125 ft.	100 ft.	N/A	N/A	N/A	N/A	N/A
55 mph	225 ft.	200 ft.	175 ft.	125 ft.	100 ft.	N/A	N/A	N/A	N/A
65 mph	400 ft.	350 ft.	300 ft.	275 ft.	250 ft.	200 ft.	150 ft.	100 ft.	N/A
70 mph	475 ft.	450 ft.	400 ft.	375 ft.	325 ft.	275 ft	225 ft.	150 ft.	N/A
75 mph	575 ft.	550 ft.	500 ft.	475 ft.	425 ft.	375 ft.	300 ft.	250 ft.	175 ft.
80 mph	650 ft.	625 ft.	575 ft.	550 ft.	500 ft.	450 ft.	400 ft.	350 ft.	275 ft.

If the posted speed or advisory limit is lower than what is provided in the table, refer to Table 2C-3 of the MUTCD.

Clear Zone Table

	DESIGN ADT	FORESLOPE			BACKSLOPE		
		1V:6H	1V:5H	1V:4H	1V:4H	1V:5H	1V:6H
≤ 40 mph	Under 750	7-10	7-10	7-10	7-10	7-10	7-10
	750-1500	12	12	14	12-14	12-14	12-14
	1500-6000	14	14	16	14-16	14-16	14-16
	Over 6000	16	16	18	16-18	16-18	16-18
45-50 mph	Under 750	12	12	14	8	10	10
	750-1500	16	16	20	12	14	14
	1500-6000	18	20	26	14	16	16
	Over 6000	22	24	28	18	20	20
55 mph	Under 750	14	14	18	10-12	10-12	10-12
	750-1500	18	20	24	14	16	16
	1500-6000	22	24	30	16	18	20
	Over 6000	24	26	32	20	22	22
60 mph	Under 750	18	20	24	12	14	14
	750-1500	24	26	32	16	18	20
	1500-6000	30	32	40	18	22	24
	Over 6000	32	36	44	24	26	26
65-75 mph	Under 750	20	20	26	14-16	14-16	14-16
	750-1500	26	28	36	18	20	20
	1500-6000	32	34	42	22	24	26
	Over 6000	34	38	46	26	30	28

Notes for Figure 28
Bump on a Road

1. **This layout is not in a work zone and the signs will be in place during daylight and darkness; therefore, the signs shall be reflectorized yellow in color.**
2. The sign at the bump location will be either a BUMP sign with a supplemental arrow, or a Type 1 object marker (see page 87 object marker OM1-3). **The bottom of the Object Marker shall be installed four feet above the surface elevation of the nearest driving lane.**
3. **On multi-lane divided roads, signs shall also be placed on the left shoulder.**

Two-Lane: hinged signs shall be 42” x 42” in size
Multi-Lane Divided: hinged signs shall be 54” x 54” in size

Road Type	Distance (ft.)
	A (min.)
Urban - Low Speed (40 mph of less)	100
Urban - High Speed (greater than 40 mph)	350
Rural	500
Urban Expressway/Freeway (60 mph or less)	750
Rural Expressway/Freeway (greater than 60 mph)	1,000

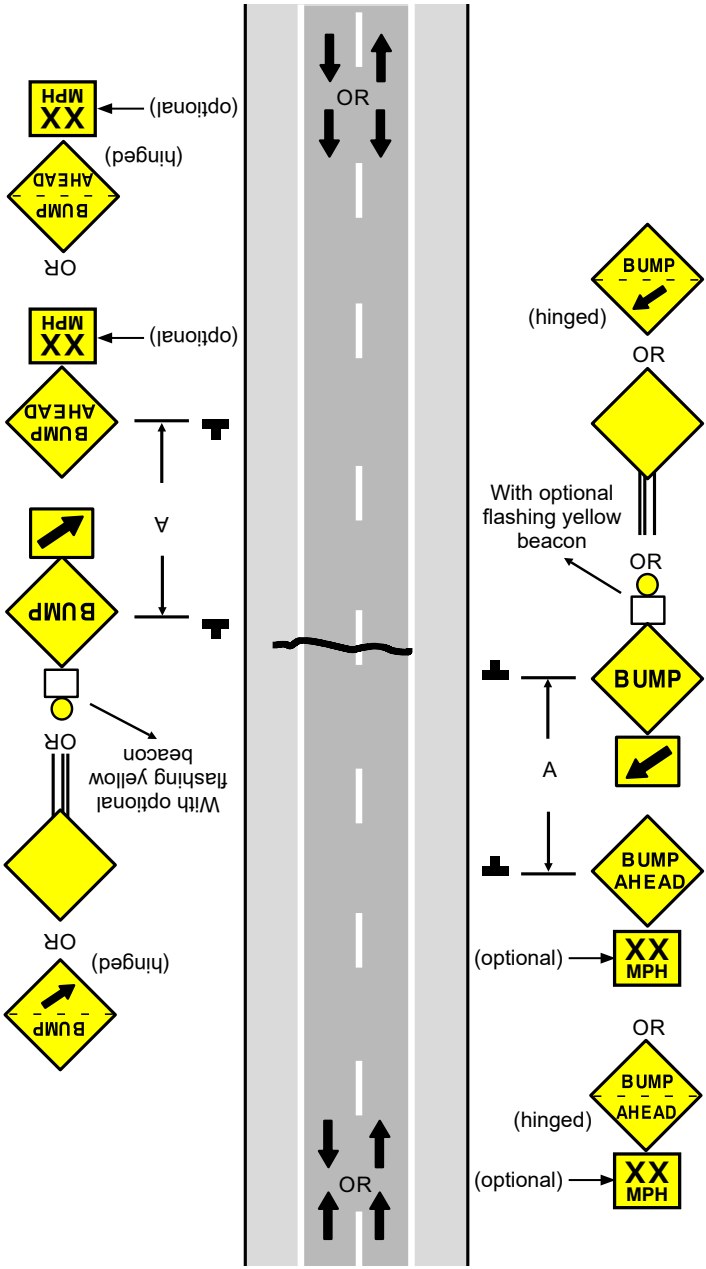


Figure 28: Bump on a road
(see Note 3 for multi-lane roads)

Notes for Figure 29
Series of Bumps or Pavement Breaks

1. **This layout is not in a work zone and the signs will be in place during daylight and darkness; therefore, the signs shall be reflectorized yellow in color.**
2. **If the bumps or pavement breaks extend over 5 miles, additional BUMP or PAVEMENT BREAKS signs with mileage plates shall be placed every 5 miles (or less to equalize spacing) throughout the affected length of roadway; however, on interstate and controlled access highways, the required signing will consist of placing one sign with mileage plate on each shoulder following each interchange.**
3. **On multi-lane divided roads, signs shall also be placed on the left shoulder.**
4. The sign at each bump location or at the beginning of a stretch of broken pavement will be a Type 1 object marker (See page 87 object marker OM1-3). **The bottom of the Object Marker shall be installed 4 feet above the surface elevation of the nearest driving lane.**
5. This layout is to be used if there is an average of 3 or more bumps per mile and the bumps extend over 1 mile; or if there is an average of 3 or more stretches of pavement breaks per mile and the breaks extend over 1 mile.
6. Supplemental advisory speed plaques may be used.

Two-Lane: hinged signs shall be 42” x 42” in size
Multi-Lane Divided: hinged signs shall be 54” x 54” in size

Road Type	Distance (ft.)
	A (min.)
Urban - Low Speed (40 mph of less)	100
Urban - High Speed (greater than 40 mph)	350
Rural	500
Urban Expressway/Freeway (60 mph or less)	750
Rural Expressway/Freeway (greater than 60 mph)	1,000

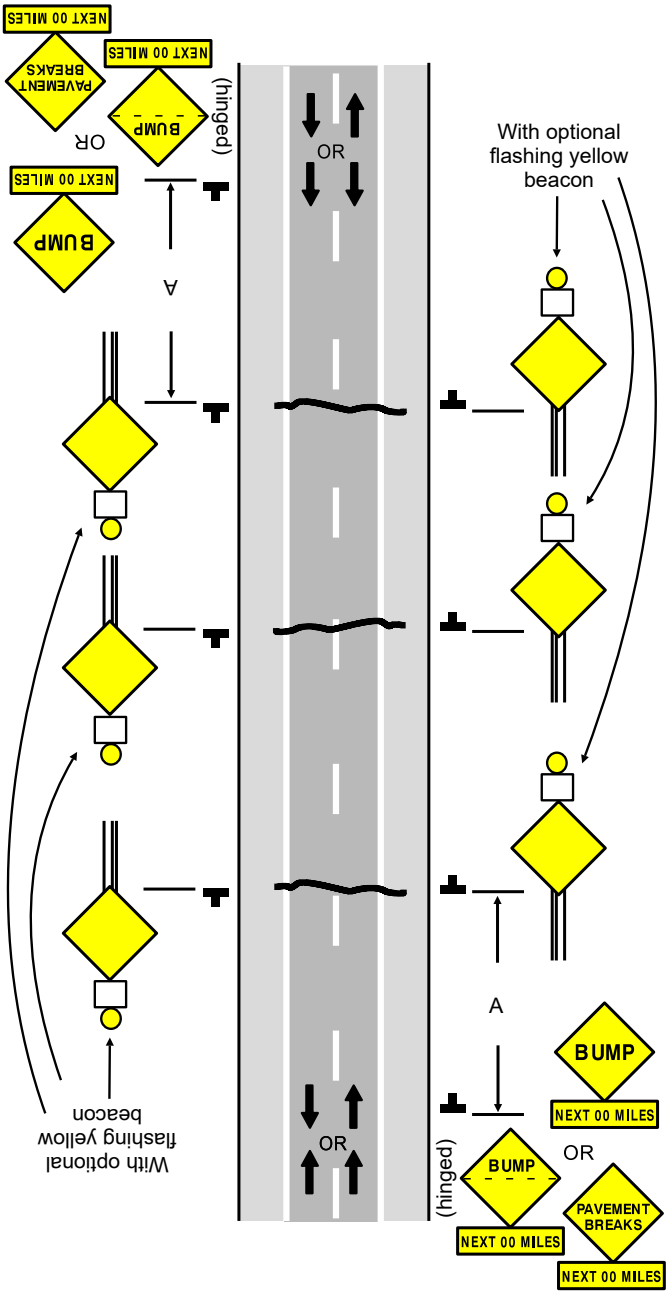


Figure 29: Series of bumps or pavement breaks
(see Notes 2 and 3 for multi-lane roads)

Notes for Figure 30
Soft Shoulder

1. **This layout is not in a work zone and the signs will be in place during daylight and darkness; therefore, the signs shall be reflectorized yellow in color.**
2. **The advisory mileage plate shall be installed below the warning sign when there are continuous or intermittent soft shoulders for a length of 1 mile or more.**
3. **On multi-lane divided roads, signs shall be placed on the soft shoulder side only.**
4. If the soft shoulders extend over 5 miles, additional SOFT SHOULDER signs with mileage plates will be installed every 5 miles (or less to equalize spacing) throughout the affected length of roadway; however, on interstate and controlled access highways, the required signing will consist of placing one sign with mileage plate on each shoulder following each interchange.

Road Type	Distance (ft.)
	A (min.)
Urban - Low Speed (40 mph of less)	100
Urban - High Speed (greater than 40 mph)	350
Rural	500
Urban Expressway/Freeway (60 mph or less)	750
Rural Expressway/Freeway (greater than 60 mph)	1,000

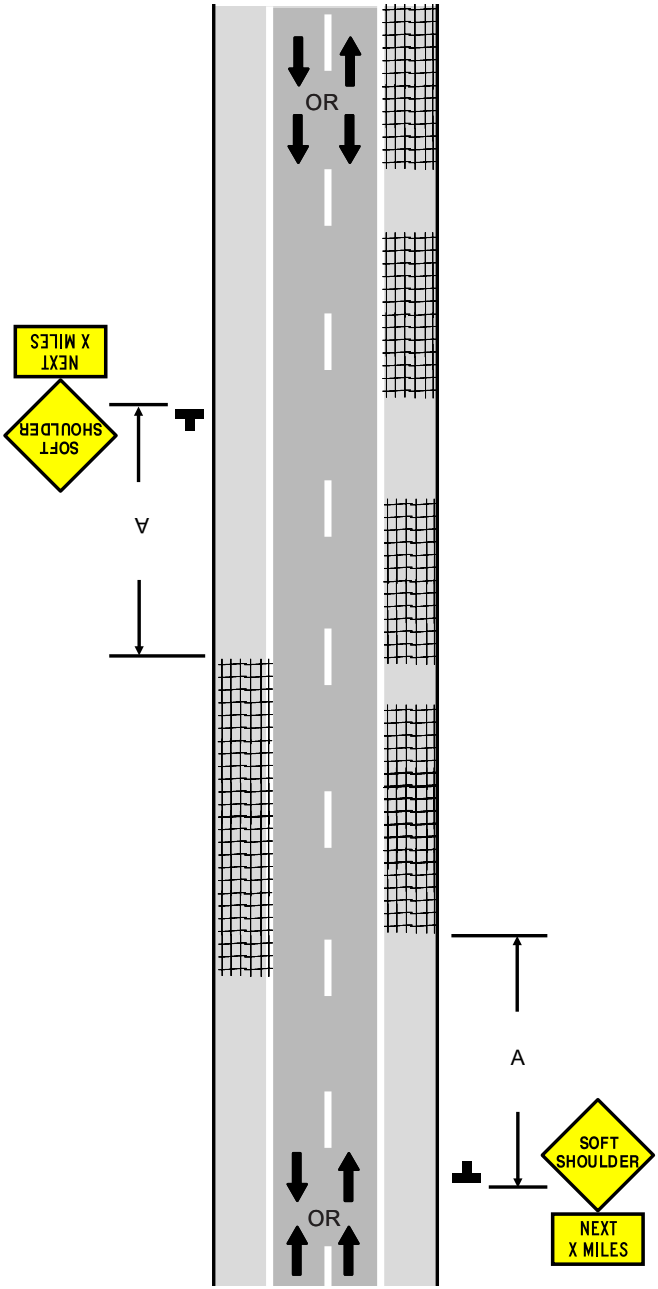


Figure 30: Soft shoulder
(see Note 3 for multi-lane roads)

Notes for Figure 31
Pavement Ends

This layout is not in a work zone and the signs will be in place during daylight and darkness; therefore, the signs shall be reflectorized yellow in color.

USE“BUMP”APPLICATION FOR TRAFFIC IN THIS DIRECTION IF TRANSITION FROM GRAVEL TO PAVEMENT IS ROUGH.

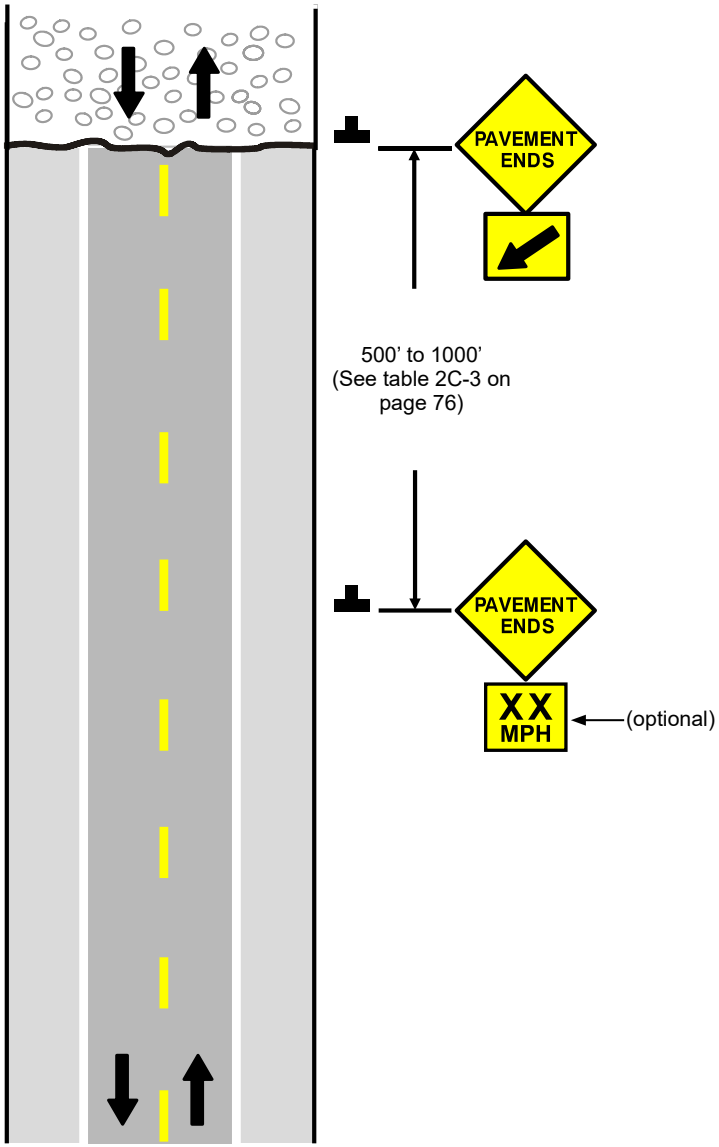


Figure 31: Pavement ends

Standard Signs

W21-1A

W21-5

W21-6

W4-1

W4-2

W4-3

W3-4

W20-7a

W8-1

W8-3

W8-4

W8-1 hinged

RW 079*

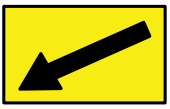
W20-1

W8-1 hinged

G20-4b

*State Numbers

RW 079* hinged



W16-7pL

W22-8

W20-5

RW 241*

W20-4

Object Marker
OMI-3 18 x 18

W21-6

W3-5

Object Marker
OM3-L

Object Marker
OM3-R

R2-1

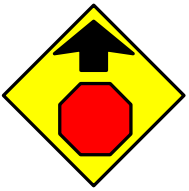
G20-4

TW 047*

R4-1

*State Numbers

W8-12



W3-1

W3-5

G20-55-96

G20-2

G20-2

R1-1

RR 127*

W7-3a

W16-2P

W13-1P

RW-145*

RW-082*

TW-104*

RR-161*

RR-162*

R1-2aP

R10-6

R1-7a

*State Numbers

R1-2

W3-2

W13-4P

E5-1-48

W20-2

W20-3

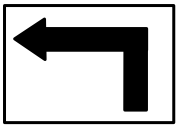
R11-2

R11-3a

M4-10

M4-8

M6-1P



M5-1P

M1-1

M1-4

M1-5

G20-1

G20-1

W21-53

W1-4

R8-8

W21-14

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