

Table of Contents

General Provisions	3
Introduction	4
Glossary	4
Temporary Traffic Control General Guidelines	8
Lane Closure System	9
Checklist for Establishing Temporary Traffic Control Zone.....	15
Sample of State Inspection Project Inspection Checklist.....	16
Temporary Traffic Control Devices	17
Channelizing Devices	18
Work Zone Signing	20
Sign Codes Quick Reference: Figure 1	21
Sign Codes Quick Reference: Figure 1	22
Typical Pedestrian Devices: Figure 2	23
Temporary Curb Ramp: Figure 3	24
Portable Changeable Message Signs (PCMS).....	25
General Guidelines	25
Messages	25
Table 2: Abbreviations Allowable on PCMS(s).....	26
Advanced Warning Arrow Board Specification: Figure 4	28
Drop-Off Guidelines: Figure 5	29
Symbols Used in Typical Layouts: Figure 6	30
General Components of a Stationary Temporary Traffic Control Zone: Figure 7	31
General Components of a Mobile Temporary Traffic Control Zone Figure 8	32
Temporary Traffic Control Distance Charts Figure 9	33
Low Volume Roads: Rural and Urban	35
Layouts 1 to 3	35
Two-Lane, Two-Way Roads.....	41
Layouts 4 to 33	41
Two-Way, Continuous Left-Turn Lane	73
Layouts 34 to 38	73
Multi-Lane Undivided Roads	81
Layouts 39 to 46	81
Multi-Lane Divided Road.....	91
Layouts 47 to 75	91
Miscellaneous Layouts	125
Layouts 76 to 87	125
Quality Standards	141
WisDOT Work Zone Contacts.....	154

Introduction

This Field Manual contains general Temporary Traffic Control (TTC) standards for Wisconsin state highways. **The user shall follow any TTC plans, specifications, and special provisions written for a specific project and then follow the Field Manual for all other layouts.** Any work that affects road users (including vehicles, bicycles, and pedestrians) requires proper TTC plans.

The goal of the TTC zone is to provide for the safe and efficient movement of traffic around a location where the normal function of the roadway is temporarily suspended. To accomplish this, the respect of the driver must be earned by appropriate and prudent use of traffic control devices. When work is not in progress or the hazard no longer exists, place TTC devices away from traffic outside of the paved and gravel shoulder surfaces. Remove or lay signs and supports flat on the grade with the uprights oriented parallel to and downstream from traffic.

This Field Manual contains layouts for typical TTC zones ranging from mobile operations to zones which may remain in place for up to three days. If the TTC zone is to remain in one place for more than three days or involves a detour, road closure, or a situation where the typical layouts do not apply, WisDOT's Traffic Engineering staff should be consulted and a project-specific TTC plan prepared. Advance planning is necessary for a successful TTC zone.

This Work Zone Field Manual applies to planned work zone activities which, by their nature, are different from responding to an incident. Prior to completing activities in a work zone or responding to an incident, including debris removal, personnel shall assess current traffic conditions and the risks associated with completing the work and placing traffic control devices when determining the most appropriate technique to accomplish the task. This manual provides layouts illustrating the minimum requirements for temporary traffic control for planned work zone activities based on type of facility, volume of traffic, speed of users, type of activity, and duration of the work.

Prior to starting work, permission shall be obtained from WisDOT. For counties doing maintenance, coordinate with the appropriate WisDOT Regional Maintenance Unit. For all other work, a Permit must be approved by WisDOT.

When used in this Manual, the text headings shall be defined as follows:

1. A statement of policy is required, mandatory, or specifically prohibitive practice regarding a traffic control device. The verb **shall** is typically used.
2. A statement of guidance is recommended, but not mandatory, practice in typical situations, with deviations allowed if engineering judgment or engineering study indicates the deviation to be appropriate. The verb **should** is typically used.
3. A statement of optional practice is a permissive condition and carries no requirement or recommendation. The verb **may** is typically used.

Glossary

Advance Warning Following Distance

The distance in a mobile operation between the Shadow Vehicle and the Work Vehicle. It is used to provide advance warning to traffic that some type of work is being done within the traffic lane. Traffic will have to change lanes, slow down, and wait for a safe time to pass, or adjust their position within the lane to allow for a narrower traffic lane. The Shadow Vehicle shall be equipped with appropriate advance warning signing. Typical Advance Warning Following Distances (L) are included in the TTC Distance Charts. This distance is a range with a minimum of the recommended distance between Advance Warning Signs (A, X, Y, Z), and a maximum of the Decision Sight Distance (D). These distances are dependent upon the roadway and traffic conditions.

Advance Warning Sign Spacing (A, X, Y, Z)

The distance between signs or between a sign and some other location or device within the TTC zone. This distance is determined by the posted speed limit. Signs should be placed to allow adequate time for a motorist to read the signs and react accordingly. Typical Advance Warning Sign Spacings (A, X, Y, Z) are included in the TTC Distance Charts.

Advisory Speed

The recommended speed for all vehicles operating on a section of highway based on the highway design, operating characteristics, and conditions.

Average Daily Traffic (ADT)

The average number of vehicles passing a specific point in both directions in an average 24-hour period.

Clear Zone

The work zone clear zone is the unobstructed (clear of obstructions, hazards, or fixed objects), relatively flat area impacted by construction that extends outward from the edge of the traveled way. Because of the limited horizontal clearance available and the heightened awareness of motorists through work zones, recommended clear zones are less than those for the non-construction conditions. Table 1 gives typical clear zone widths that should be provided when roadside space is available.

Table 1: Recommended Clear Zones

Posted Speed	Width (ft)
60 or greater	15' lower minimum; 20' typical
45-55	10' lower minimum; 15' typical
40 or less	8' lower minimum; 10' typical
Bridge project with Temporary Signal, one open lane shared by both directions	12' from open traffic lane

Crashworthy

A characteristic of roadside devices that have been successfully crash tested in accordance with the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features" or the American Association of State Highway and Transportation Officials (AASHTO) "Manual for Assessing Safety Hardware (MASH)."

Decision Sight Distance (D)

The total distance traveled during the length of time required for a driver to detect a hazard, recognize its potential threat, select an appropriate speed and path, and perform the required action safely and efficiently.

Downstream Taper

The taper at the end of the activity area which guides traffic back into its original lane. Minimum taper length is approximately 50 feet.

Duration

The length of time any work operation occupies a specific location or causes a traffic obstruction without changing the location. This time is measured from the first disruption to traffic until the total clearing of the area. The following durations are defined in overlapping intervals. Temporary Traffic Control layouts for longer durations may always be used for shorter durations, especially when roadway attributes such as traffic volume and speed, and the work space location may warrant higher levels of traffic control.

- Mobile - work that moves intermittently or continuously
- Short Duration - work that occupies a location up to 1 hour.
- Short-Term - daytime work that occupies a location for more than 1 hour within a single daylight period.
- Intermediate-Term/Night - work that occupies a location more than one daylight period up to 3 days or nighttime work lasting more than 1 hour.
- Long-Term - work that occupies a location more than 3 days.

Fixed Object

Hazards that are firm, unyielding, and greater than 4 inches in height along the roadside such as bridge piers, abutments, footings, walls, posts, trees, construction equipment, supplies, stockpiles, and large boulders.

Lateral Buffer Space

The space that separates the traffic space from the work space. It is typically the extra space provided between traffic and workers, excavations, pavement edge drop-offs, or an opposing lane of traffic. Traffic lanes may be closed to provide for lateral buffer space.

Longitudinal Buffer Space (B)

The distance between the transition area and the work space. If a driver does not see the advance warning or fails to negotiate the transition area, a buffer space provides room to stop before the work space. Typical Longitudinal Buffer Spaces (B) are included in the TTC Distance Charts.

Merging Taper (L)

This taper is used on a multi-lane road to close a lane and combine its traffic from that of the adjacent lane. Its length is dependent on the posted speed of the roadway. Higher speeds require a longer distance for traffic to merge lanes. Typical Merging Tapers (L) are included in the TTC Distance Charts.

Off Shoulder

A work space located primarily off of the shoulder, or which causes little or no restrictions on the use of the shoulder. This work space should have little or no interference with traffic such that traffic speeds generally are not reduced.

Portable Changeable Message Sign (PCMS)

A sign either trailer-mounted or vehicle-mounted that is capable of displaying more than one message, changeable by remote or automatic control.

Posted Speed Limit

The speed limit determined by law and shown on regulatory speed limit signs. It is used in the Temporary Traffic Control Distance Charts to determine the spacing of TTC devices and the lengths of various tapers on the TTC layouts.

Protection Vehicle

The vehicle that is placed in advance of the work space and equipment to block errant motorists from entering work area.

Roll Ahead Distance (R)

The recommended minimum distance from the front of the Protection Vehicle to the beginning of the work space. A Protection Vehicle may be used in a mobile operation to provide extra safety for the workers. R is defined by the manufacturer of each TMA and shall be used.

Shadow Vehicle

Vehicle(s) placed in advance of the work space in a mobile operation to provide advance warning to motorists. If Shadow Vehicle operates completely or partially in the live traffic lane it shall have a TMA.

Shifting Taper

The taper used to move traffic from the traffic lane onto a by-pass, shoulder or another traffic lane.

Shoulder Closure

A closure of the roadway shoulder for work operations. The shoulder becomes unusable by traffic for vehicle maneuvers or break-downs. TTC layouts for work operations using or on a shoulder are dependent on the type of shoulder usage and duration.

Shoulder Taper

The taper used to close the shoulder to traffic so that shoulder work can be performed or equipment can be placed on the shoulder. Since this taper is used to guide errant traffic back into its normal lane path, it does not require a full merge distance. The taper length is reduced to one-third of a merging taper length. See Figure 9, TTC Distance Charts for the length of a shoulder closure taper ($L/3$).

Termination Area

Part of the TTC zone located beyond the work area which guides traffic back into its normal path.

TMA (Truck/Trailer Mounted Impact Attenuator)

Energy-absorbing devices attached to the rear of vehicles in work zones that primarily reduce the severity of impacts from errant vehicles.

Transition Area

Part of TTC zone that moves traffic from its normal path or lane into the traffic space by using channelizing devices and directional signing.

Work Area

Part of TTC zone closed to traffic and set aside for workers, equipment and materials.

Work Zone

Work Zone

An area of a roadway where road user conditions are changed because of a work space by the use of TTC devices, flaggers, uniformed law enforcement officers, or other authorized personnel. Wisconsin State Statute 349.065, states *Local authorities shall place and maintain traffic control devices upon highways under their jurisdiction to regulate, warn, guide or inform traffic. The design, installation and operation or use of new traffic control devices placed and maintained after the adoption of the uniform traffic control devices manual under Wisconsin State Statute 84.02(4)(e) shall conform to the manual. After January 1, 1977, all traffic control devices placed and maintained by local authorities shall conform to the manual.*

340.01(22e) "Highway maintenance or construction area" means the entire section of roadway between the first advance warning sign of highway maintenance or construction work and an "END ROAD WORK" sign or, in the case of a moving vehicle engaged in the maintenance or construction work, that section of roadway where traffic may return to its normal flow without impeding such work.

Work Zone Speed Limits

A regulatory speed limit in a TTC zone. If workers are present within 12 feet of live traffic without positive protection on a posted 70 or 65 mph roadway, the speed limit shall be lowered to 55 mph. If work is taking place outside the clear zone, do not lower the speed limit. Do not reduce the speed on 70 and 65 mph facilities lower than 55 mph. Document the reduced regulatory speed in LCS or in the Permit. If work area is less than or equal to 0.5 miles in length with no lane shifts or narrowed travel lanes and positive protection, then do not lower the speed limit.

Temporary Traffic Control General Guidelines

Individual Responsibilities

The user shall follow any TTC plans, specifications, and special provisions written for a specific project and then follow the Field Manual for all other layouts. Qualified individuals who have adequate training in Temporary Traffic Control and have a basic understanding of the Wisconsin Manual on Uniform Traffic Control Devices (WMUTCD) should supervise the selection, placement, and maintenance of traffic control devices in TTC zones.

General Responsibilities

Except where otherwise specified, any public or private agency performing work within the right-of-way of streets or highways open to public travel shall be responsible for:

- Supplying, installing, and maintaining all necessary traffic control devices outlined in this manual and as stipulated by the road authority to protect the work space and safely direct traffic around the TTC zone.
- Supplying their own flagger(s) when required.
- Informing occupants of abutting properties, either orally or by written notice, of parking prohibitions or access limitations.
- Notifying WisDOT when existing traffic signs need to be removed or relocated or when any regulatory sign must be installed for construction or maintenance work.
- Replacing or reimbursing WisDOT for any damage to or loss of existing traffic signs or devices.
- Prior to beginning work, check all equipment and devices to make sure everything is working properly.
- Keeping all traffic control devices clean and in proper position to ensure optimum effectiveness.
- Removing traffic control equipment when it is no longer required or appropriate.
- Performing and documenting routine day and night inspections of the TTC zone.

Lane Closure System

Provide the following advance notification for incorporation into the Wisconsin Lane Closure System (LCS). Any closure 30 minutes or greater in duration requires an entry in the Lane Closure System, LCS. Closures less than 30 minutes in duration will not require an LCS entry.

CLOSURE TYPE AND REQUIRED MINIMUM ADVANCE NOTIFICATION

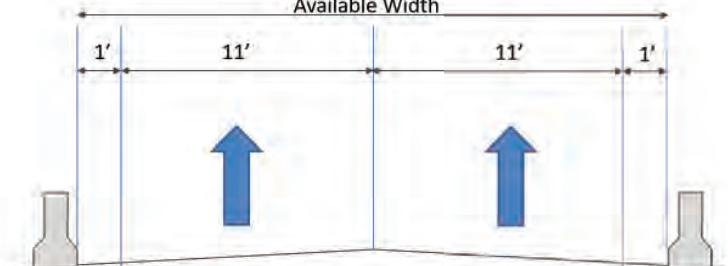
Closure type with height, weight, or width restrictions (available width, all lanes in one direction <16')	MINIMUM NOTIFICATION
Lane and shoulder closures	7 calendar days
Full roadway closures	7 calendar days
Ramp Closures	7 calendar days
Detours	7 calendar days
Closure type without height, weight, or width restrictions (available width, all lanes in one direction ≥16')	MINIMUM NOTIFICATION
Lane and shoulder closures	3 business days
Ramp closures	3 business days
Modifying all closure types	3 business days

Width Restrictions and Lane Closure System

Example 1

2 Lanes Open

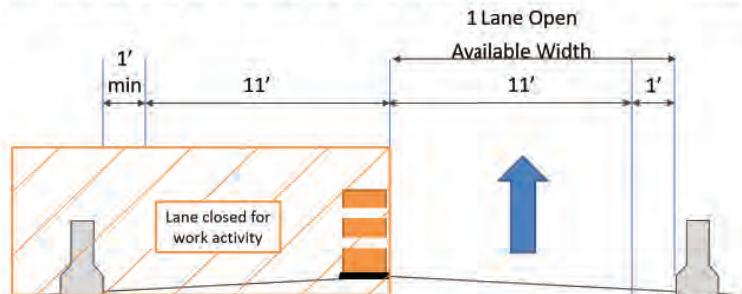
Available Width



$$\text{LCS Entry} \rightarrow (1' + 11' + 11' + 1') - 1' \text{ buffer} = \underline{\underline{23' \text{ effective width}}}$$

Available Width

Available width ≥ 16': No width warning sign required.

Width Restrictions and Lane Closure System**Example 2**

$$\text{LCS Entry} \rightarrow (11' + 1') - 1' \text{ buffer} = \underline{\underline{11' \text{ effective width}}}$$

Width Signing → 11' Max Width

Available width < 16':

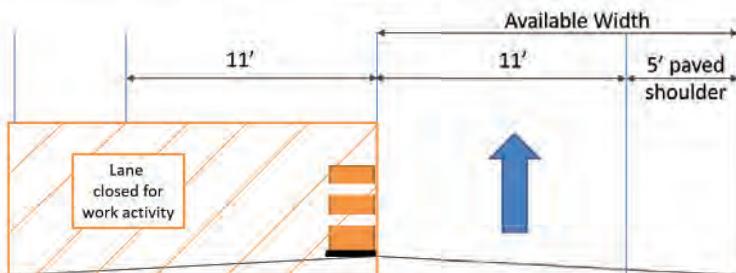
Width warning sign(s) required.

Recommend 2 Locations:

- One in WZTC advanced warning area
- One at location where a wide load could exit with supplemental **XX AHEAD** sign below

Width Restrictions and Lane Closure System**Example 3**

2 Lane Open



$$\text{LCS Entry} \rightarrow (11' + 5') - 1' \text{ buffer} = \underline{\underline{15' \text{ effective width}}}$$

Available width ≥ 16': No width warning sign required.

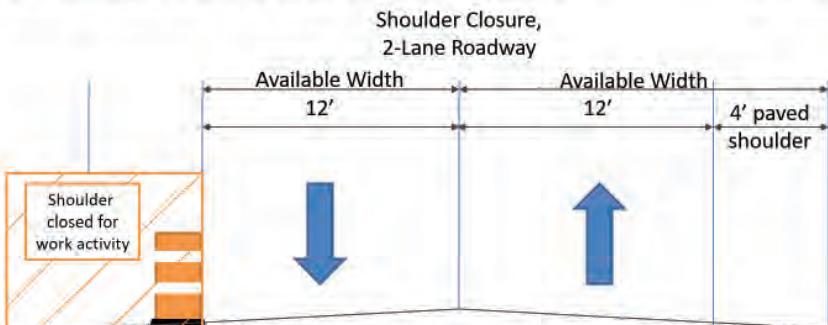
Width Restrictions and Lane Closure System**Example 4**

$$\text{LCS Entry} \rightarrow (12' + 12' + 5') - 1' \text{ buffer} = \underline{\underline{28' \text{ effective width}}}$$

Available width

Available width $\geq 16'$: No width warning sign required.

Not changing the typical width available for this facility.

Width Restrictions and Lane Closure System**Example 5**

$$\text{SB LCS Entry} \rightarrow (12') - 1' \text{ buffer} = \underline{\underline{11' \text{ effective width}}}$$

Available width

Width Signing \rightarrow 11' Max Width

Available width $< 16'$:

Width warning sign(s) required.

Recommend 2 Locations:

- One in WZTC advanced warning area
- One at location where a wide load could exit with supplemental **XX AHEAD** sign below

Permission to Work Within the Right-of-Way

Prior to starting work, permission shall be obtained from WisDOT. WisDOT Regional Offices may limit the hours of work or have other requirements such as detours, parking restrictions, etc. Peak traffic periods vary by hour or day-of-week and all work should be scheduled during non-peak hours.

Follow the above LCS guidelines prior to beginning work on the Wisconsin State Highway System.

When working in or near an intersection with a traffic control signal system, the road authority with jurisdiction over the signal should be contacted to ensure proper operation of the signal while the work is in progress.

Any work requiring traffic control to extend across a railroad right-of-way requires coordination with the railroad authority.

Selecting an Appropriate Temporary Traffic Control Layout

The Field Manual has been organized such that field personnel are able to determine the proper Temporary Traffic Control layout(s) for the work zone they need. The layouts are divided primarily by the type of roadway and type of work space. The roadway designations are:

1. Low Volume Rural/Residential,
2. Two-Lane, Two-Way Roads (low, intermediate, and high volumes),
3. Roads with Two-Way Continuous Left-Turn Lanes,
4. Multi-Lane Undivided Roads, and
5. Multi-Lane Divided Roads.

After determining the type of roadway upon which the work space will be located, the type of work space needs to be determined. The work space is the area within the right-of-way that will be closed from normal usage. It includes all the area needed by support equipment, materials, workers, and vehicles. It may require the closing of a lane(s), the shoulder(s) of the road, or turn lane(s) within an intersection. The work space may even be completely off the roadway shoulder such as on side-slopes or along sidewalks. The layouts are listed by the typical work space areas. Continuity for existing road users (vehicles, pedestrians, and/or bicyclists) needs to be provided by the temporary traffic control. If variations are made, discuss changes with WisDOT Regional personnel for approval and properly document the agreed upon changes.

All distances shown on the layouts and charts are approximate. In general, all chart distances vary based upon the posted speed limit. Adjustments to these distances should be made based on traffic entry points and decision sight distance.

Additional layouts have been placed in this manual for unique operations and special signing conditions. These layouts may have special restrictions and guidelines contained within their notes.

Enhancement of Temporary Traffic Control Layouts

To improve safety, typical layouts contained in this manual may need to be modified to fit more complex roadway conditions or operations. When conditions are more complex, modifications may incorporate devices and practices from the following list:

1. Additional Personnel
 - b. Spotters
 - c. Law Enforcement
 - d. Multiple Flaggers
2. Additional Devices:
 - a. More signs or enhanced signs (using LEDs, flags, beacons, etc.)
 - b. Flashing arrow board(s)
 - c. More channelizing devices at close spacing
 - d. Temporary raised pavement markers
 - e. High-level warning devices
 - f. Portable Changeable Message Sign(s) (PCMS)
 - g. Portable traffic signals
 - h. Protection vehicles
 - i. More delineation
3. Upgrading of Devices
 - a. A complete set of standard pavement markings in high hazard areas
 - b. Brighter and/or wider pavement markings
 - c. Larger and/or more retroreflective signs
 - d. More visible channelizing devices with greater conspicuity
4. Lateral Buffer Space or Closing an Additional Lane
5. Closing Shoulders with Shoulder Tapers and/or Protection Vehicles
6. Increased Distances
 - a. Longer advance warning area
 - b. Longer tapers
7. Lighting
 - a. Temporary roadway lighting
 - b. Steady burn lights used with channelizing devices
 - c. Flashing lights for isolated hazards
 - d. Illuminated signs
 - e. Work space lighting
8. Work zone speed limits
 - a. Contact the road authority

Installing the Temporary Traffic Control Zone

Traffic control devices shall be installed in the order that drivers will see them, starting with the sign or device that is furthest upstream from the work space. If traffic in both directions will be affected, such as work in the center lane(s), the devices may be placed in both directions at the same time. When one direction of traffic will be directed into the opposing lanes of traffic, all traffic controls for the opposing traffic should be installed first.

When space constraints become an issue, lane widths may be narrowed. Lane widths may be reduced to 10 feet. Make sure to consider freight movements within the narrow lanes. When this is considered, also look at the shy distance from roadside hazards. After the Temporary Traffic Control (TTC) zone is in place, it should be inspected by driving through the zone. Motorists' actions and reactions should be noted and any problems encountered should be quickly corrected. Any modifications to the Temporary Traffic Control Plan or standard layouts and the reasons for the modifications should be documented. For additional lane width restrictions below 10', consult with DOT Regional Traffic.

During the life of a TTC zone, maintenance of devices is frequently needed. On short term operations, vehicles may knock over devices which then need to be placed upright. Problems encountered should be corrected immediately and documented.

Inspecting the Temporary Traffic Control Zone

To provide acceptable levels of operations and to maintain safety, routine day and night inspections of the TTC zone should be performed by knowledgeable personnel. See page 15, SAMPLE PROJECT INSPECTION CHECKLIST for an example inspection sheet that an inspector may use.

Removing the Temporary Traffic Control Zone

Traffic control devices should be removed as soon as the work is completed and they are no longer needed. Devices should be removed in the opposite order from which they were installed, especially devices in the termination, activity, and transition areas. Devices in the advance warning area may be removed in the order they were installed. Alternatively, a Mobile Lane Closure may be used to remove the TTC devices in the order that they were installed. Once the termination, activity and transition area devices are removed, then take down the advance warning signs.

Crossing Live Lanes of Traffic

Personnel may cross live traffic lanes only if it is safe to do so utilizing a walking pace taking into consideration roadway geometry, traffic volume, and other appropriate factors. Do not drag or carry TTC devices from one side of the roadway to the other side.

Roadside Safety

Attention should be given to the maintenance of roadside safety during the life of the TTC zone.

In urban areas with curbs, wide clear zones are typically much more difficult to achieve; in these areas, a minimum lateral offset to obstruction of 1.5 feet should be provided behind the curb face.

When work is not active, hazards or fixed objects should not be left or placed within the clear zone distance from Table 1, depending on the road environment. If not practical to remove hazards or fixed objects, they should be protected with temporary barrier. If not practical to provide temporary barrier, hazards or fixed objects shall be delineated with channelizing devices.

Marking Hazards

Damaged infrastructure (such as washouts, damaged guardrail, impacted end treatments and light poles) should be repaired as soon as possible (based on agency priorities); however, until the repair occurs, these hazards should be marked with either a Type II barricade with a Type A flashing warning light or a retroreflectorized drum. Cones may be used for short-term emergency situations.

Certain construction operations may leave structures (manhole covers, drainage structures, etc.) exposed above the grade or dropped below the grade in the traffic space of the activity area. These shall be made apparent so that drivers, bicyclists, and pedestrians are able to avoid them or slow down to minimize the hazard.

Use drums, barricades, and temporary barrier to delineate and shield abrupt drop-offs and other hazards.

Checklist for Establishing Temporary Traffic Control Zone

The following items should be addressed for establishing a Temporary Traffic Control Zone

- Obtain permission from all affected road authority(ies).
- Determine the type of roadway.
- Determine the type of road users (vehicles, pedestrians, bicyclists).
- Determine the type of work space.
- Determine the duration of work.
- Select hours of work to avoid peak periods.
- Select the appropriate layout(s) using:
Type of roadway, type of work, duration, traffic volume, speed, and impact on pedestrian and bicycle travel (see the appropriate Index Chart at the start of each section). Review all notes on layout(s).
- Determine any modifications to typical layout(s).
- Check Decision Sight Distance(s) (D).
- If possible, maintain access to intersections, parking areas, driveways (public and private), and mass transit.
- Coordinate with mass transit if needed.
- Allow for buffer space free of obstructions.
- Contact the road authority if the work zone interferes with normal signal operation in the area.
- Check the condition and orientation of devices (see Quality Standards).
- Install devices beginning with the first device the driver will see.
- Conduct a drive-through to check for problems, modify as needed.
- Document Temporary Traffic Control zone problems and major modifications to the layouts.
- Observe traffic to see if the TTC is working correctly.
- Remove or cover the devices as soon as work is suspended or completed.

**Sample of State Inspection
Project Inspection Checklist**

PROJECT - _____

ITEM	YES	NO	HOW MANY?
1. Are any devices missing? Do any devices need repair? Were all replaced or repaired?	<input type="checkbox"/>	<input type="checkbox"/>	_____
2. Are any lights (flashers, etc.) not functioning? Were they all replaced or repaired?	<input type="checkbox"/>	<input type="checkbox"/>	_____
3. Are any devices improperly placed? Were all positions corrected?	<input type="checkbox"/>	<input type="checkbox"/>	_____
4. Do any devices need cleaning? Were all devices cleaned?	<input type="checkbox"/>	<input type="checkbox"/>	_____
ADDITIONAL COMMENTS ON THE BACK OF THIS FORM?	<input type="checkbox"/>	<input type="checkbox"/>	_____
	<input type="checkbox"/>	<input type="checkbox"/>	_____
	<input type="checkbox"/>	<input type="checkbox"/>	_____

The above check was completed by _____
(name/title)

on _____ at _____ a.m. p.m.
(date) (time)

Temporary Traffic Control Devices

Crashworthy Testing Compliance

With the exception of Trailer Mounted Devices described below, TTC devices, including channelizing devices, Type III barricades, ballast systems, and sign support structures used on any roadway open to public travel, shall be crashworthy when installed facing traffic. Use devices on the Wisconsin Approved Products list.

FHWA policy requires that all roadside appurtenances, including TTC devices, have been successfully crash tested in accordance with the National Cooperative Highway Research Program (NCHRP) Report 350, "Recommended Procedures for the Safety Performance Evaluation of Highway Features" or the American Association of State Highway and Transportation Officials (AASHTO) "Manual for Assessing Safety Hardware (MASH)."

All new devices purchased for use on the state highway system must meet MASH 2016 standards. Devices that do not meet this requirement will have sunset dates set by the Department and published on the approved products list for when the devices can no longer be used.

Trailer Mounted Devices

When required, trailer mounted devices, such as Arrow Boards and Portable Changeable Message Signs shall be installed per Layout 5. When not in use, the devices should not be stored on the shoulder.

High-Visibility Clothing

All workers who are exposed to traffic, work vehicles, or construction equipment within the TTC zone shall wear high-visibility safety apparel meeting ANSI/ISEA 107-2015 type R class 2.

Clothing shall have an attached original label indicating the Performance Class. When working in an area that does not require the use of a hard hat for head protection, a high-visibility hat may be worn.

Vehicle Warning Lights

All vehicles shall have approved operating vehicle warning lights when decelerating to enter a TTC zone and again when a vehicle leaves the TTC zone and enters the traveled traffic lane. All vehicles within a mobile TTC operation shall have approved vehicle warning lights. Vehicle warning lights shall be visible for 360 degrees around the vehicle.

Optional Devices

Some signs and devices on the TTC layouts are shown as optional or have factors that may make them optional. Some advance warning signs and/or channelizing devices may be omitted for low-speed roads and/or if the duration will be less than 1 hour. Read the associated notes on each layout for options.

Channelizing Devices

The function of channelizing devices is to delineate a desired vehicle path, mark specific hazards on or near the roadway, separate opposing traffic flows, and partially or totally close the roadway. See Figure 5, Longitudinal Drop-off Guidelines for the use of channelizing devices adjacent to shoulder edge drop-offs or uneven lanes.

Channelizing devices include cones, drums, barricades, temporary raised islands, and various kinds of markers. Follow Standard Specifications for Highway and Structure Constructions for more detailed information on device sheeting standards. Visibility is determined based upon the total retroreflective area of the device.

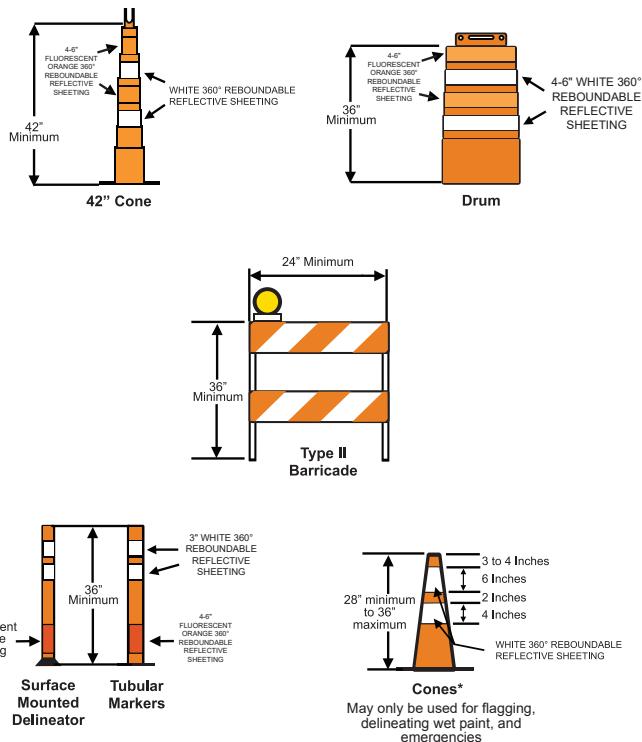
For lane and shoulder closures on all highways, only use drums in the tapers. Drums are also the preferred channelizing device along the tangent section of the lane closure. 42-inch cones may be used in the tangent section but the spacing must be reduced by half.

Flaggers that move every 15 minutes may use cones less than 42-inches tall to help direct traffic to the proper side of the road.

Flashing warning Type "A" lights are required on barricades if remaining overnight.

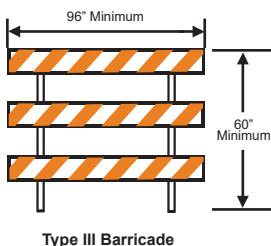
Steady burn Type "C" lights required on drums in tapers if remaining overnight.

Channelizing Devices



TYPE 3 BARRICADES

- Orange diagonals shall slope down toward the traffic side.
- Signs mounted on Type III barricades should not cover more than half of the top two rails or 33 percent of the total area of the three rails.
- Type A Flashing Warning Lights may be used - place on both side of barricade. Required for nighttime work or if device remaining overnight.



Work Zone Signing

As a general rule, signs should be located on the right-hand side of a two-way roadway and on both the right and left sides of a multi-lane divided roadway. When special emphasis is needed, signs may be placed on both the left and right sides of a two-way roadway. Signs, although ordinarily mounted on posts for long-term operations, may be mounted on or above barricades or on temporary supports.

Signs mounted on temporary supports should not be placed in the open traveled lane where they pose a hazard to traffic nor where pedestrians are expected to travel. Generally, these signs are placed on the shoulder or in the parking lane of the street or highway. The signs should not be blocked from view by parked vehicles, trees, or other sight obstructions on or near the roadway. Any portable sign or barricade placed in a pedestrian walkway that could be a hazard to a visually impaired pedestrian should have a detectable edge to guide the pedestrian around the hazard. Signs mounted on portable supports should not be used for a duration of more than 7 days.

Signs shall not be mounted on existing traffic signs, posts, or other utility structures without permission from the proper authority. All signs shall be mounted so that the sign face is approximately perpendicular to the roadway and vertically plumb in accordance with Quality Standards. The bottom of signs mounted on barricades or temporary supports shall be no less than 1 foot above the traveled way. Supplemental advisory plaques shall be placed directly below or on the lower side of the warning sign nearest traffic.

Some activity areas move slowly down a roadway and away from the operation's advance signing. The distance from the last advance warning sign to the activity area should not allow the motorist to forget the existence of the TTC zone. For high-speed streets and rural highways, the maximum distance from the last sign to a point where the driver detects the activity area shall not exceed 3500'. In urban areas, the number of intersections shall be considered and this distance reduced accordingly.

When available width is less than 16 feet, a Max Width (W12-52) sign should be used. The width shown should be 1 foot less than available width.

All warning signs shall be at least 48 x 48 inches in size.

Reference the WisDOT Sign Code Manual for sign sizes based on facility type.

Advance warning signs should be installed for drivers entering the TTC zone from cross streets. ROAD WORK AHEAD signs on intersecting roadways shall be installed if the motorist will not encounter another advance warning sign prior to reaching the activity area except for mobile operations.

All signs shall be retroreflective with a material that has a smooth sealed outer surface that shows the same shape and color both day and night. Non-retroreflective mesh signs shall not be used at any time.

Roll-up signs may be used for daytime and for nighttime only when workers are present to monitor the signs.

Follow Standard Specifications for Highway and Structure Construction for more detailed information on signing details.

	R1-1		R9-9		W04-2 (R or L) Lane Ends
	R1-2		R9-10		W05-1
	R2-1		R9-11 (R or L)		W06-3 2 Lane Road
	R2-6P		R10-6		W057-51
	R3-1 No Right Turn		R11-2		W08-1
	R3-2 No Left Turn				W08-2
	R3-5O (R or L)				W08-8
	R3-7L				W08-9
	R3-18 U-Turn & Left Turn Prohibition				W08-15
	R4-7 Keep Right				W9-3A Center lane closed merge left
	R4-11 Bikes may use full lane				
	R3-20 (R or L)				

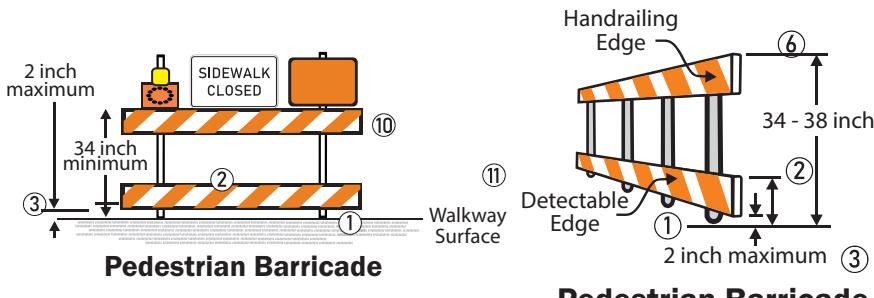
For additional signs and information on typical sizes and usage, see the WisDOT Sign Plate Manual

Sign Codes Quick Reference: Figure 1

 W08-4	 W12-52 Max Width	 W024-1 Double Reverse Curve (R or L)
 W012-1D Double Arrow	 W20-58A	 G20-4
 W013-1	 W20-53A	 W21-62Q
 W016-7 (R or L)	 W21-65	 G20-51
  W21-7 W20-1	 W04-1 (R or L)	 G20-57
 W20-3A	 W04-5	 G20-2A
 W20-4A	 W21-5	 W08-76
 W20-7A Flagger Ahead	 W21-66	 G20-1
  W20-5	 W21-64	 D9-6 Handicapped Accessible

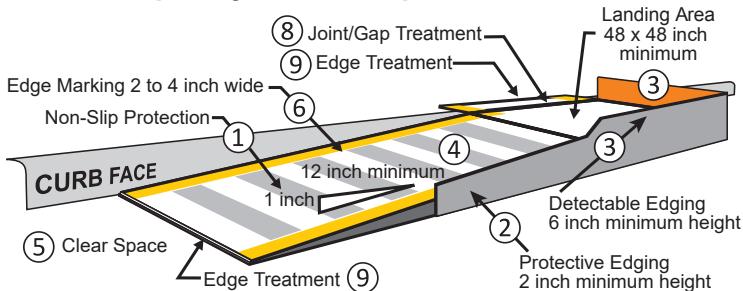
For additional signs and information on typical sizes and usage, see the WisDOT Sign Plate Manual

Sign Codes Quick Reference: Figure 1

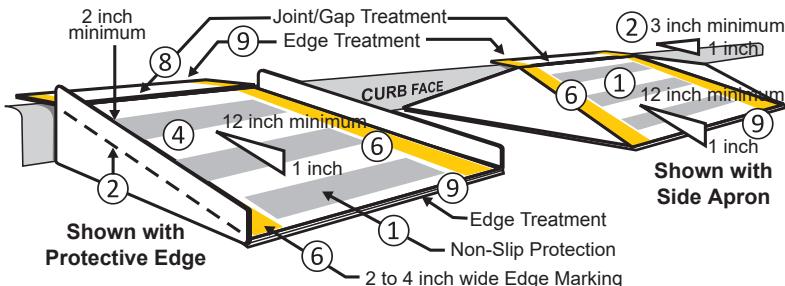
**NOTES:**

1. To prevent any tripping hazard to pedestrians, ballast shall be located behind or internal to the device. Any support on the front of the device shall not extend into the 48-inch minimum walkway clear space and shall have 2-inch maximum height above the walkway surface with approved beveling.
2. Detectable edges for long canes shall be continuous and 6 inches minimum above the walkway surface and have color or markings contrasting with the walkway surface. The detectable edge around a portable sign stand should be placed in the walkway area in which the sign poses a hazard to a visually impaired pedestrian.
3. Devices shall not block water drainage from the walkway. A gap height or opening from the walkway surface up to 2-inch maximum height is allowed for drainage purposes.
4. Railings or other objects may protrude a maximum of 4 inches into the walkway clear space when located 27 inches minimum above the walkway surface.
5. Longitudinal channelizing devices for pedestrians shall be 32 inches high or greater.
6. When hand guidance is required, the top rail or top surface shall be:
 - In vertical plane perpendicular to the walkway above the detectable edge,
 - Continuous at a height of 34 to 38 inches above the walkway surface, and
 - Supported with minimal interference to the pedestrian's hands or fingers.
7. All devices shall be free of sharp or rough edges and fasteners (bolts) shall be rounded to prevent harm to a person or clothing.
8. All devices used to channelize pedestrian flow should interlock such that gaps do not allow pedestrians to stray from the channelized path.
9. Any pedestrian devices used to provide positive protection (traffic or hazard) for pedestrians or workers shall meet crashworthy requirements appropriate for the barriers' application.
10. Barricades shall be used to close the entire width of the walkway surface.
11. A walkway surface shall be firm, stable, and slip-resistant.

Temporary Curb Ramp - Parallel to Curb



Temporary Curb Ramp - Perpendicular to Curb



NOTES:

1. Curb ramps shall be 48 inches minimum width with a firm, stable, and non-slip surface.
2. Protective edging with a 2-inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of 6 inches or greater or has a side apron slope steeper than 1:3 (33%). Protective edging should be considered when curb ramps or landing platforms have a vertical drop of 3 inches or more.
3. Detectable edging with 6 inches minimum height and contrasting color shall be installed on all curb ramp landings where the walkway changes direction (turns).
4. Curb ramps and landings should have a 1:50 (2%) max cross-slope.
5. Clear space of 48 x 48 inches minimum shall be provided above and below the curb ramp.
6. The curb ramp walkway edge shall be marked with a contrasting color 2-to 4-inch-wide marking. The marking is optional where color contrasting edging is used.
7. Water flow in the gutter system shall have minimal restriction.
8. Lateral joints or gaps between surfaces shall be less than 0.5 inches in width.
9. Changes between surface heights should not exceed 0.5 inches. Lateral edges should be vertical up to 0.25 inches high, and beveled at 1:2 between 0.25 inches and 0.5 inches in height.
10. Whenever pedestrians are going to intersect with vehicle traffic, a detectable warning field is required.

Temporary Curb Ramp: Figure 3

Portable Changeable Message Signs (PCMS)

The primary purpose of PCMS is to advise the driver of unexpected traffic and routing situations. State-owned PCMS are capable of being set up manually or controlled remotely by the Traffic Management Center (TMC). Manual setup allows a designated user to program the sign using the on-board computer keyboard. Remote control of PCMS is performed by operators located in the control room at the TMC. State-owned PCMS that have a cellular connection and are in good working condition can be programmed and scheduled to display messages remotely.

PCMS COORDINATION WITH THE TRAFFIC MANAGEMENT CENTER (TMC)

Please contact stcc@dot.wi.gov or 414-227-2142.

General Guidelines

- A PCMS should be used to supplement conventional signs, pavement markings, and lighting.
- If a PCMS is used as an arrow board, it shall meet all of the requirements of an arrow panel, and shall be used solely as an arrow board.
- A PCMS installed on the shoulder of a road shall be accompanied with channelizing devices (see Layout 5).

Messages

- Each display should contain a single thought. The message should consist of no more than two phases.
- The entire message should be readable twice at the posted speed limit. Blank or filler frames shall not be used.
- An accurate description of the work location or the incident location is critical.
- The PCMS shall have readable up-to-date information. Any delay message should accurately reflect the traffic delay time.
- The PCMS message shall use days of the week, not calendar dates, unless the PCMS is placed 7 days in advance.
- The use of abbreviations is discouraged. The entire word should be spelled out whenever space permits.
- If multiple PCMS are used, make sure the messages do not conflict.
- **DANGER, HAZARDOUS, OR CAUTION** shall not be used.
- Frames should be read in either direction.

For more information on the use of PCMS, see the TEOpS 6-2-55

Table 2: Abbreviations Allowable on PCMS(s)

Emergency Word Message	Standard Abbreviation	Emergency Word Message	Standard Abbreviation
Access	ACCS	Expressway	EXPRS, EXPWY**
Afternoon/Evening	PM	Feet	FT
Ahead	AHD	Freeway	FRWY, FWY**
Alternate	ALT	Friday	FRI
Avenue	AVE, AV	Frontage	FRNTG
Bicycle	BIKE	Hazardous	HAZ
Blocked	BLKD	Hazardous Material	HAZMAT
Boulevard	BLVD*	High Occupancy Vehicle	HOV
Bridge	BR	Highway	HWY
Cannot	CANT	Highway-Rail Grade Crossing	RR XING
Center	CNTR	Hospital	HOSP
Center (as part of a place name)	CTR	Hour(s)	HR, HRS
Chemical	CHEM	Information	INFO
Circle	CIR**	International	INTL
Closed	CLSD, CLOSD	Interstate Numbered Route	I
Condition	COND	Junction/Intersection	JCT
Congested	CONG	Lane	LN, LA
Construction	CONST	Left	LFT, LF, L
County Road Numbered Route	CR	Local	LOC
Court	CT**	Lower	LWR
Crossing (other than highway-rail)	X-ING	Maintenance	MAINT
Do Not	DONT	Major	MAJ
Downtown	DWNTN	Maximum	MAX
Drive	DR**	Wisconsin Numbered Route	WIS
East	E	Minimum	MIN
Eastbound	E, E-BND, EB	Minor	MNR
Emergency	EMER	Minute(s)	MIN
Entrance, Enter	ENT	Monday	MON
Exit	EX	Morning/Late Night	AM
Express	EXP		

Table 2: Abbreviations Allowable on PCMS(s), cont.

Emergency Word Message	Standard Abbreviation	Emergency Word Message	Standard Abbreviation
Mount	MT	Sweeper	SWEEP
Mountain	MTN	Temporary	TEMP
National	NATL	Terrace	TER**
Normal	NORM	Thursday	THUR
North	N	Tons of Weight	T
Northbound	N, N-BND, NB	Traffic	TRAF
Oversized	OVRSZ	Trail	TR**
Parking	PKING	Tuesday	TUE
Parkway	PKWY**	Two-Way Intersection	2-WAY
Pavement	PVMT	Two-Wheeled Vehicles	CYCLES
Pedestrian	PED	Upper	UPR
Place	PL**	US Numbered Route	US
Pounds	LBS	Vehicle(s)	VEH, VEHS
Prepare	PREP	Warning	WARN
Right	RT, R	Wednesday	WED
ROAD	RD**	West	W
Roadwork	RDWK	Westbound	W, W-BND, WB
Route	RT, RTE	Will Not	WONT
Saint	ST		
Saturday	SAT		
Service	SERV		
Shoulder	SHLDR		
Signal	SIGNL		
Slippery	SLIP		
South	S		
Southbound	S, S-BND, SB		
Speed	SPD		
Stadium	STDM		
Street	ST**		
Sunday	SUN		

NOTES:

* A space and no dash shall be placed between the abbreviation and the number of the route.

** This abbreviation shall not be used for any application other than the name of a roadway.

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)

Flashing Arrow



Do not use sequential arrow or chevron mode

Move/Merge Right

2. The following mode shall be provided:

Flashing Double Arrow



Move/Merge Right or Left

3. One of the following two modes shall be provided:

Flashing Four Corners



Flashing Bar



Panel Type	Minimum Size (Inches)	Minimum Legibility Distance (Miles)	Minimum Number of Elements	Recommended Usage
A	48 x 24	0.50	12	Low Speed Streets
B	60 x 30	0.75	13	Anything not covered in A or C
C	96 x 48	1.00	15	Freeways and Expressways

Arrow Stick

Arrow Sticks may supplement other TTC devices,
but shall not be used in place of arrow boards

Eliminate vertical drop-offs greater than 2 inches and edge slopes steeper than 3:1 between adjacent lanes open to traffic. Unless otherwise noted, address hazards when they exist within 8 feet of the lane as follows:

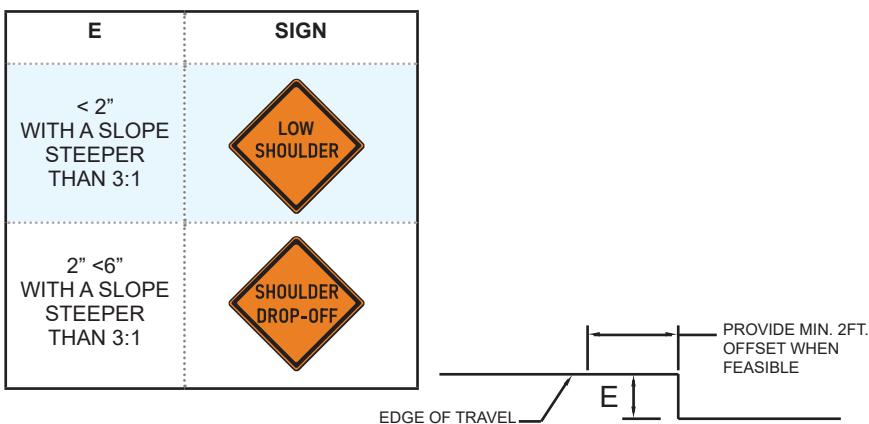
- Delineate vertical drop-offs 2 inches or greater and edge slopes steeper than 3:1 with drums, barricades, and signs, by the end of the work day.
- Eliminate vertical drop-offs 2 inches or greater and edge slopes steeper than 3:1 within 72 hours or before a weekend or holiday whichever comes first.
- Eliminate or use temporary barrier to protect vertical drop-offs 4-inches or greater after 72 hours or before a weekend or holiday whichever comes first.

If a 4-inch or greater vertical drop-off or an edge slope steeper than 3:1 exists between 8 and 15 feet of the lane, delineate that drop-off or edge slope with drums, barricades, and signs by the end of the work day.

If a 12-inch or greater vertical drop-off exists between 8 and 15 feet of a lane with a posted speed limit of 55 mph or greater, eliminate or use temporary barrier to protect that drop-off within 72 hours or before a weekend or holiday whichever comes first.

Remove construction hazards, stored materials, and equipment not in use; or delineate and shield with concrete barrier for the following:

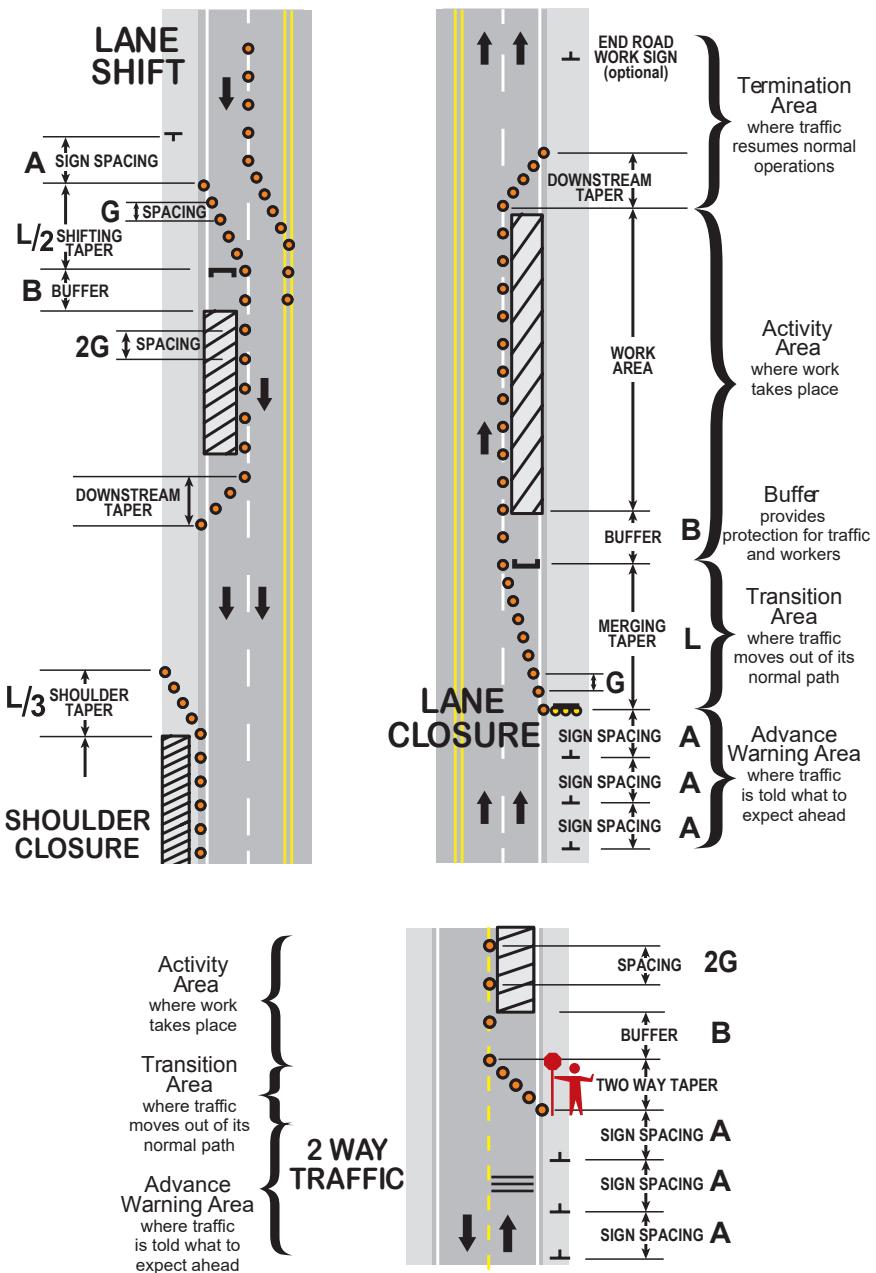
- Posted speeds 45 mph or less: within 8 feet of the lane.
- Posted speeds from 45 mph to 55 mph inclusive: within 10 feet of the lane.
- Posted speeds above 55 mph: within 15 feet of the lane.



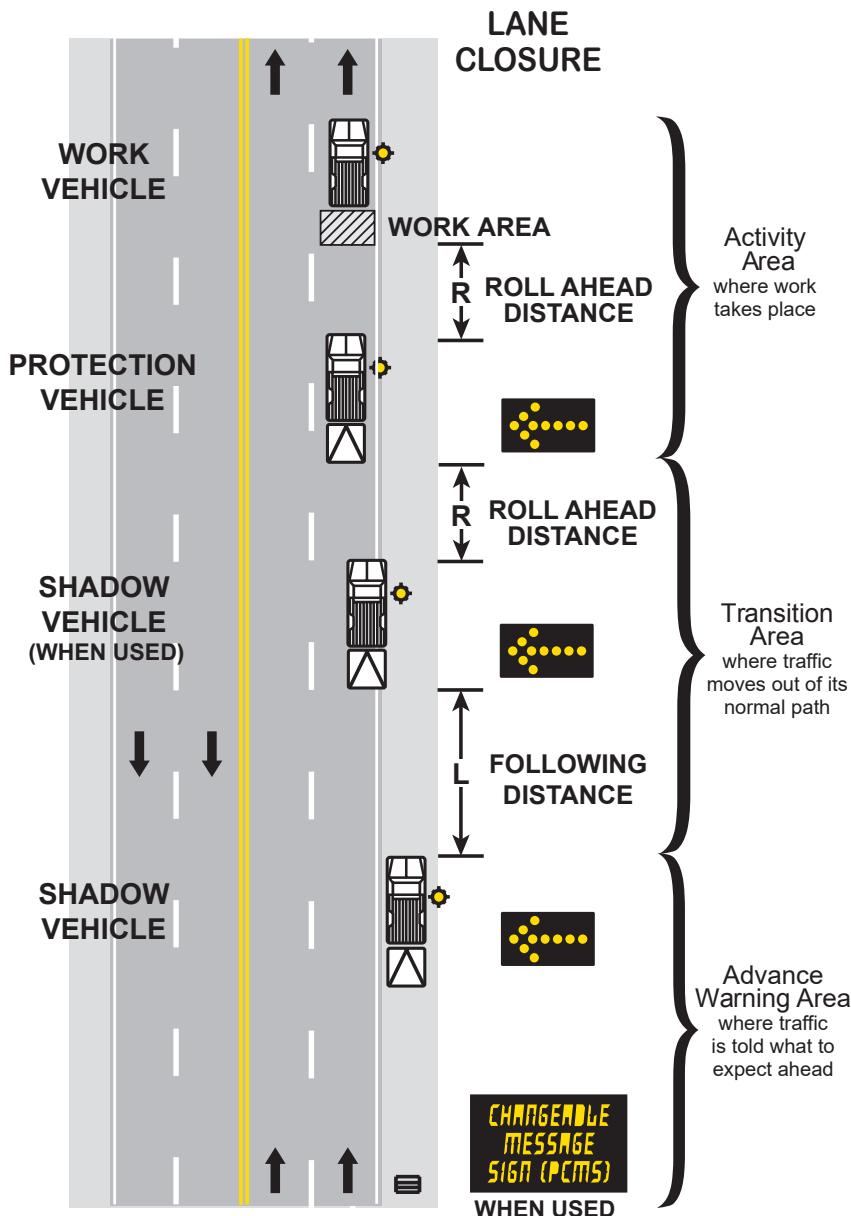
Drop-Off Guidelines: Figure 5

	Flagger or Operator of Automated Flagging Assistance Device
	AFAD Automated Flagging Assistance Device (AFAD)
	Arrow Board
	Portable Changeable Message Sign (PCMS)
	Portable Equipment - Includes testing devices, detection, surveying, etc.
	Portable Traffic Signal
	360-Degree Yellow Flashing Vehicle Light(s)
	Work Vehicle
	Work Vehicle with Crash Attenuator (Truck or Trailer Mounted)
	Motor Grader
	Mower
	Type III Barricade
	Traffic Control Sign
	Type A Flashing Warning Light
	Traffic Control Drum with Type C steady burn light (if drum is in place only during the day the light is not required)
	Channelizing Device
	Direction of Traffic
	⑥ See Note (i.e. See Note 6)
	Work Area
	Temporary Portable Rumble Strips (TPRS)

Symbols Used in Typical Layouts: Figure 6



General Components of a Stationary Temporary Traffic Control Zone: Figure 7



For more information on mobile lane closures, see Layout 46.

**General Components of a Mobile Temporary Traffic Control Zone
Figure 8**

If using 42" cones in tangent sections, spacing is G/2.

R is manufacturer specific roll ahead distances

Number of Channelizing Devices Needed in ().

Non-Freeway/Expressway OR MULTILANE DIVIDED 45 and under

Posted Speed Limit Prior to Work Starting (mph)	Advance Warning Sign Spacing (A) feet	Decision Sight Distance (D) feet	Taper Length (12 ft lane) (L) feet	Shifting Taper (12 ft lane) (L/2) feet	Buffer Space (B) feet
0-25	200	550	125 (5)	65 (3)	55 (1)
30	200	550	180 (8)	90 (4)	85 (2)
35	350	700	245 (10)	125 (5)	120 (3)
40	350	700	320 (13)	160 (7)	170 (4)
45	500	900	540 (11)	270 (5)	220 (2)
50	500	900	600 (12)	300 (6)	280 (3)
55	500	1200	660 (13)	330 (7)	335 (3)

Multi lane divided 50 mph and greater

Posted Speed Limit Prior to Work Starting (mph)	(X) Distance from Beginning of Taper	(Y) Distance from Lane Closed Sign to Road Work Ahead Sign	(Z) Distance from Lane Closed Sign to Road Work Ahead Sign	Taper Length (12 ft Lane) (L) feet	Shifting Taper (12 ft lane) (L/2) feet	Buffer Space (B) feet
50				600 (12)	300 (6)	
55				660 (13)	330 (7)	
60	G=50ft	1000	1600	2600	720 (14)	360 (7)
65					780 (15)	390 (8)
70					840 (16)	420 (8)
						500 min. - 800 max. (5-8)

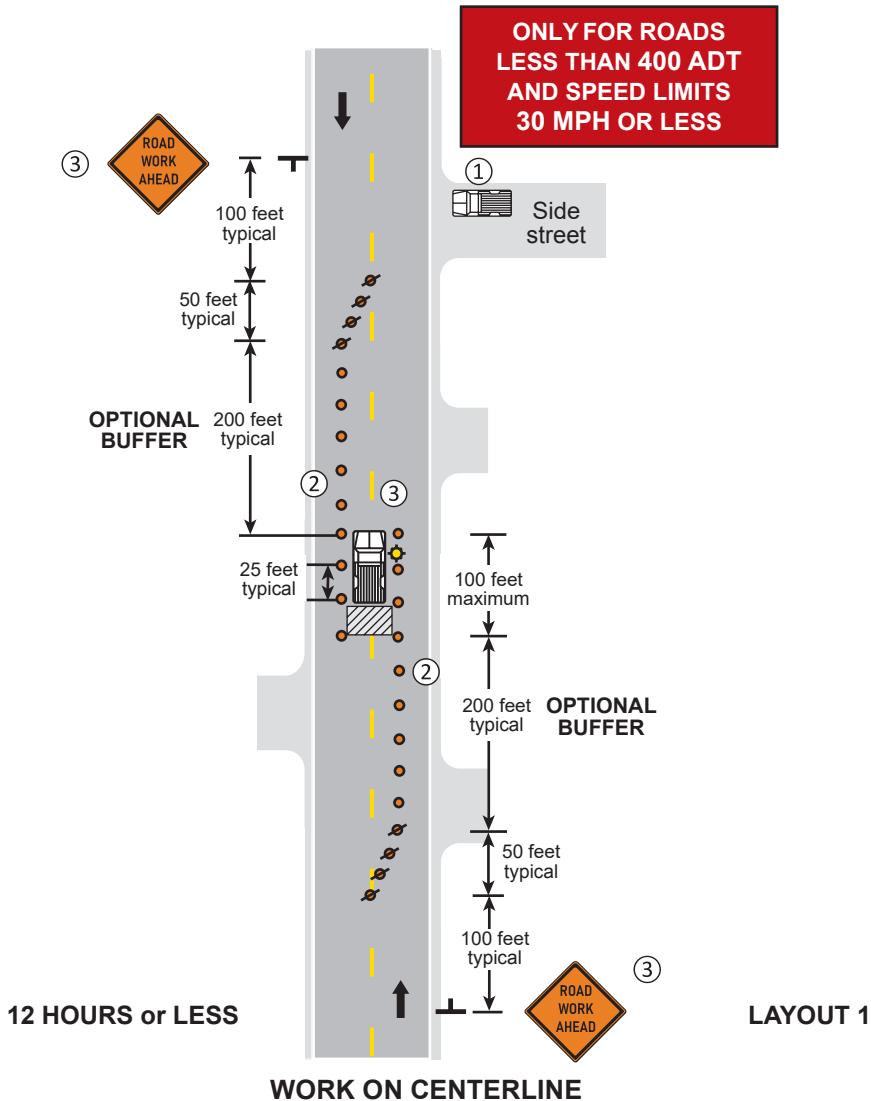
Temporary Traffic Control Distance Charts Figure 9

LOW VOLUME ROADS: RURAL AND URBAN				
Low Volume Less than 400 ADT	MOBILE 15 Minutes or Less	SHORT DURATION 1 Hour or Less	SHORT TERM 12 Hours or Less	INTERMEDIATE TERM 3 Days or Less
Work Vehicle Parked on Shoulder		4	6	
Work on Shoulder		7	6	
Work off Shoulder			6	
Work off Roadway	8			
Shoulder or Parking Lane Closure			6	
Partial Shoulder Closure for Trailer Mounted Devices			5	
1 Flagger Control		14		
2 Flagger Control		15*		
Moving Work Spaces		16*		
Near Intersection		19*, 20*		
Pilot Car Operation		17*		
Flagging Crossroads and Blind Curves		18*		
Portable Signal Control			21	
STOP Sign Control			12	
Turn Lane Closures		29, 30		
Lane Shift		25		
Work on Centerline	1 (30 mph or less only)			
Work in Center of Road			2	
Work in Intersection		3 (30 mph or less only)		
Temporary Road Closure (15 Minute Intervals)		27		
Temporary Road Closure		27, 28		
Sidewalk Closure		85, 86		
Gravel Road Maintenance		26		

* This layout may be used for nighttime operations only if the flagging stations are occupied and illuminated with auxiliary lighting such as floodlights or balloon lighting except in emergency situations.

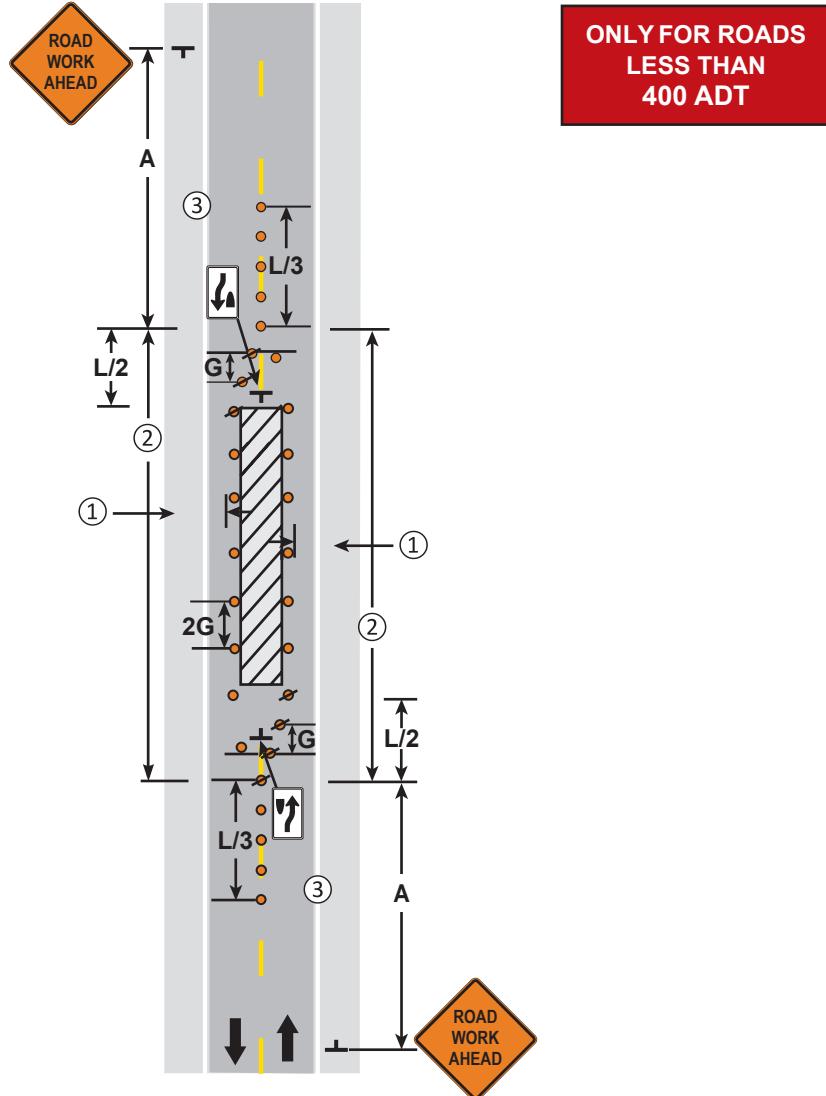
NOTES:

- ① Additional Work Vehicle shall be parked off of the roadway.
Do not obstruct the shoulder in the work area.
- ② A minimum of 10 feet of drivable surface outside of the channelizers should be maintained on all sides. Anything less than 10 feet shall be approved by the road authority.
- ③ Channelizers and ROAD WORK AHEAD signs are optional at 15 minutes or less.
4. END ROAD WORK sign should be placed 500 feet past work area.
5. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



NOTES:

- ① A minimum drivable surface outside of the channelizing devices shall be 10 feet.
- ② Parking and stopping should be prohibited along the work area and tapers.
- ③ Keep Right sign may be omitted if posted speed limit is 40 mph or less.
4. END ROAD WORK sign should be placed 500 feet past work area.
5. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



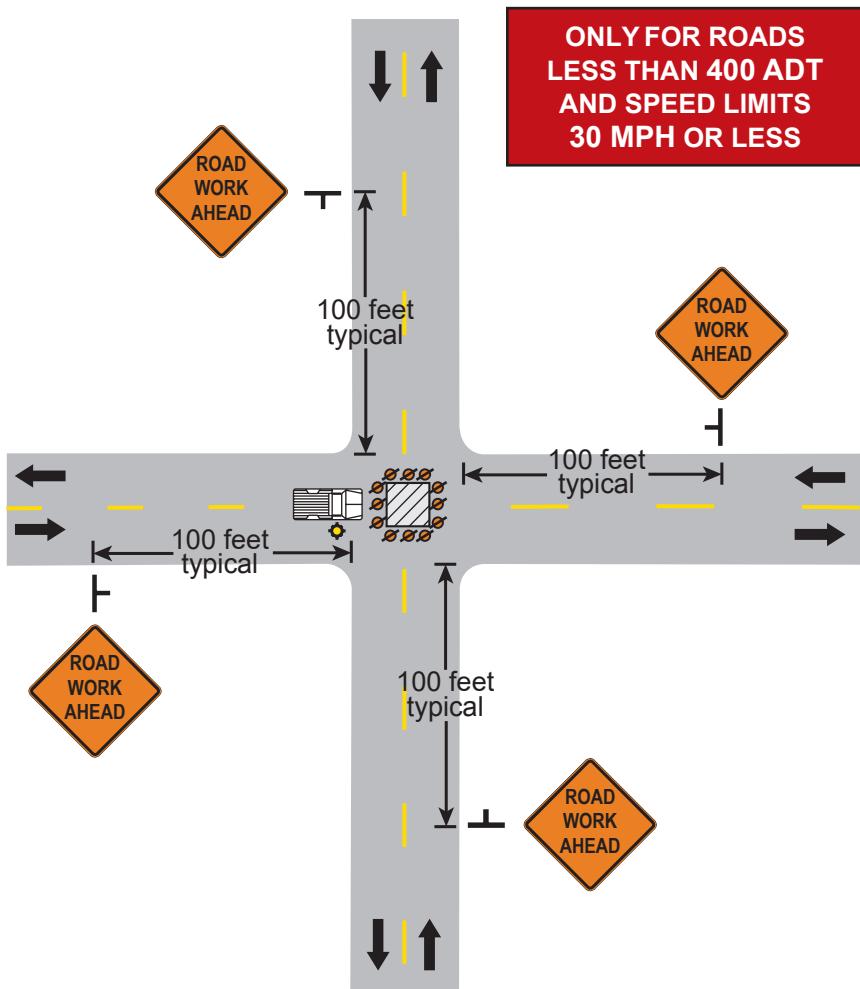
**WORK SPACE IN CENTER OF ROAD
TWO-LANE, TWO-WAY ROAD**

3 DAYS or LESS

LAYOUT 2

NOTES:

1. A minimum of 10 feet of drivable surface outside of the channelizers shall be maintained such that traffic can self-regulate.
2. END ROAD WORK sign should be placed 500 feet past work area.
3. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



CLOSURE IN CENTER OF INTERSECTION

3 DAYS or LESS

LAYOUT 3

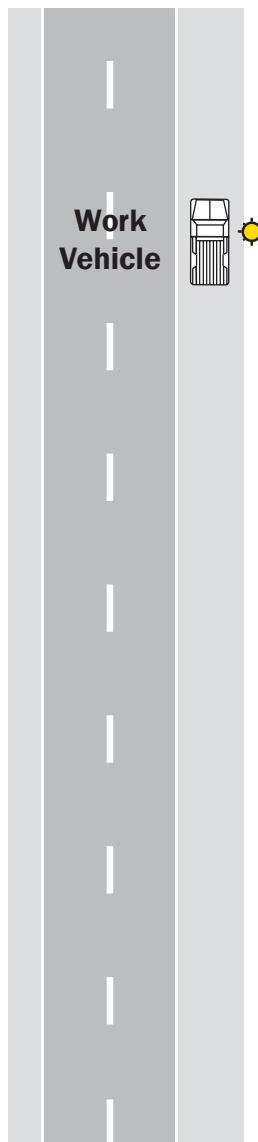
TWO-LANE, TWO-WAY ROADS				
Intermediate Volume UP to 1500 ADT	MOBILE 15 Minutes or Less	SHORT DURATION 1 Hour or Less	SHORT TERM 12 Hours or Less	INTERMEDIATE TERM 3 Days or Less
Debris Removal in Lane	9			
Flagger Control		22*	14*	
STOP Sign Control			12	
Work in Center of Road		23*		
All ADTs	MOBILE 15 Minutes or Less	SHORT DURATION 1 Hour or Less	SHORT TERM 12 Hours or Less	INTERMEDIATE TERM 3 Days or Less
Work Vehicle Parked on Shoulder		4		6
Work on Shoulder		7		6
Work off Shoulder			6	
Work off Roadway	8			
Shoulder or Parking Lane Closure			6	
Partial Shoulder Closure for Trailer Mounted Devices			5	
Lane Closure	10	11*	15*	
Moving Work Spaces		16*		
Near Intersection			19*, 20*	
Pilot Car Operation			17, 18*	
Flagging Crossroads and Blind Curves			18*	
Automated Flagger Assistance Device (AFAD)			21*	
Portable Signal Control		21		
Work in Center of Road		24*		
Lane Shift		25		
Turn Lane Closures			29, 30	
Temporary Road Closure (15 minute intervals)		27*		
Temporary Road Closure			28	
Sidewalk Closure			85, 86	
Gravel Road Maintenance		26		
Crossroad and Confirmation Signing			31	

See Low Volume Roads section for ADTs less than 400

* This layout may be used for nighttime operations only if the flagging stations are occupied and illuminated with portable lights.

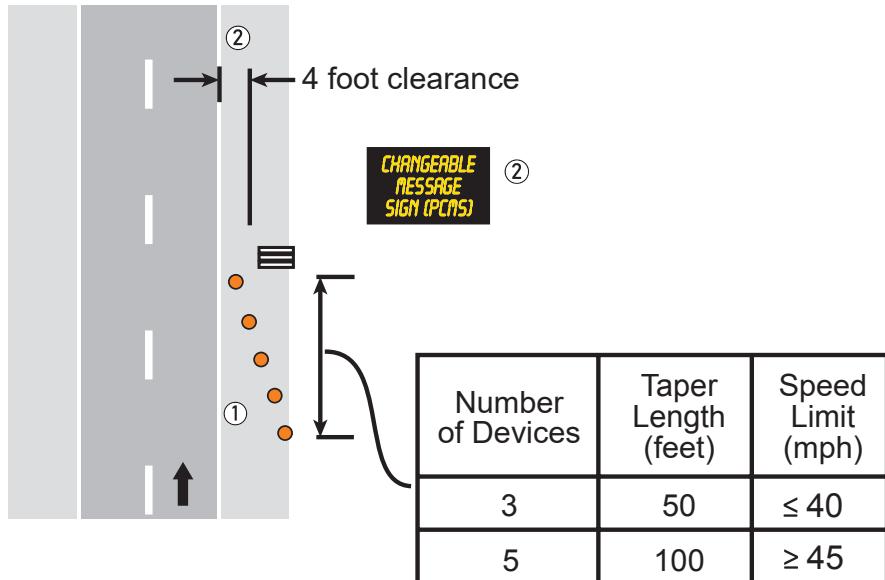
NOTES

1. The Work Vehicle should be pulled over as far off the roadway as possible, and shall display and operate a 360-degree flashing beacon.

**WORK VEHICLE PARKED ON SHOULDER**

NOTES:

- ① Drums shall be used in the shoulder taper regardless of the location on the shoulder or the width of the shoulder, when device in place for more than one hour.
- ② Trailer-mounted traffic control devices should be placed at least 4 feet from the traveled lane. If a 4-foot clearance cannot be met, then the taper length shall be doubled.
- 3. This layout maybe used for PCMS placement 7 days prior to work beginning.

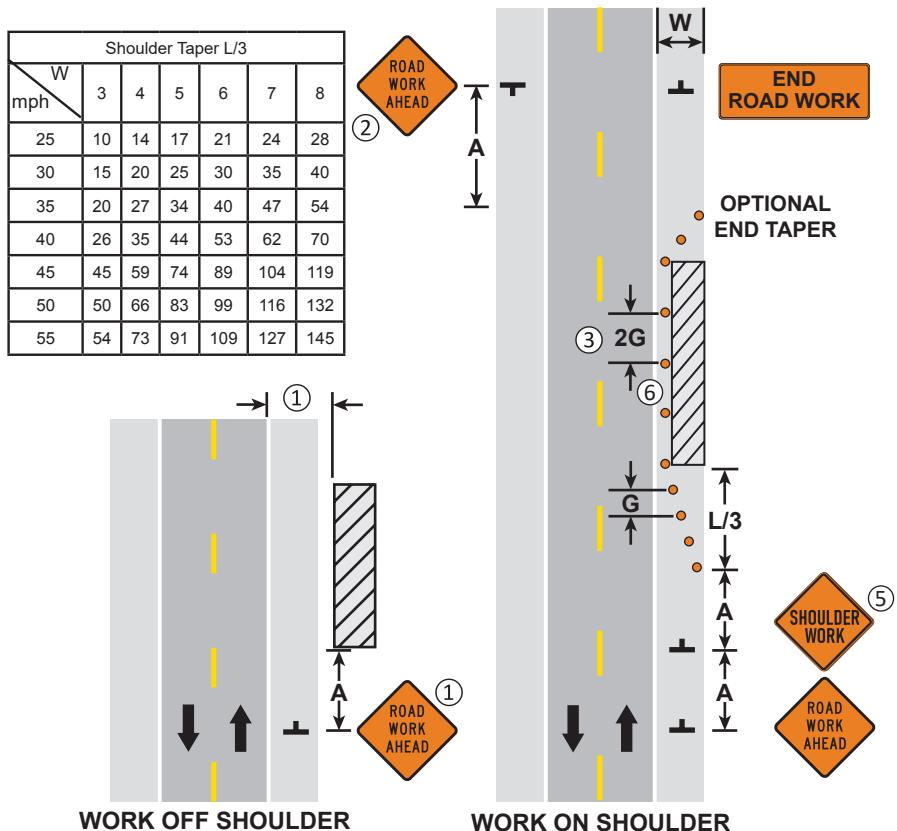


**TRAILER-MOUNTED DEVICES ON SHOULDER
PARTIAL SHOULDER CLOSURE
MORE THAN 1 HOUR**

LAYOUT 5

NOTES:

- ① The ROAD WORK AHEAD sign may be omitted for short term daylight operations if a vehicle is displaying and operating a 360-degree flashing beacon and:
 - a. The distance from curb face to the work space is at least 2 feet, or
 - b. The distance from the edge of the roadway to the work space is at least 15 feet.
- ② This ROAD WORK AHEAD sign shall be installed on two-lane, two-way roads if traffic control devices are installed for a work space in the opposite shoulder.
- ③ If this layout is used to close a parking lane that is normally open to vehicle travel during the time of day the closure will be in effect, the lane shall be considered a traveled lane and not a parking lane. Layout 39 shall be used to provide traffic control for the lane closure.
4. If this layout is used to close a parking lane, channelizer spacing may be reduced from 2G to G in high volume areas.
5. Change SHOULDER WORK sign to ROAD NARROWS sign if work encroaches the live lane.
6. ROAD WORK AHEAD and END ROAD WORK signs are not required if the work area is within a larger work zone where these signs are already present.



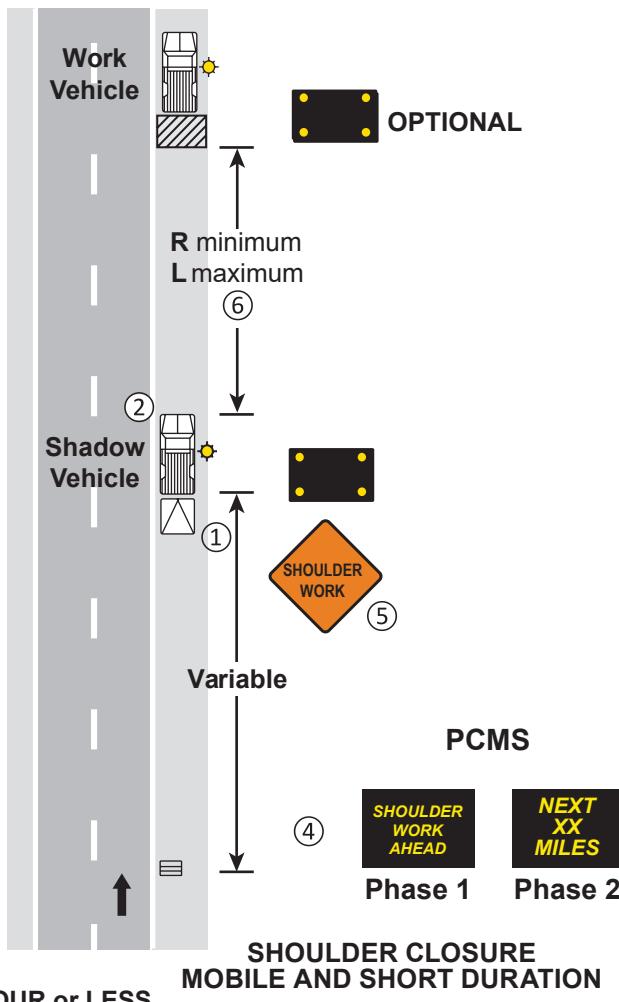
SHOULDER AND PARKING LANE CLOSURE WORK ON or NEAR SHOULDER

3 DAYS or LESS

LAYOUT 6

NOTES:

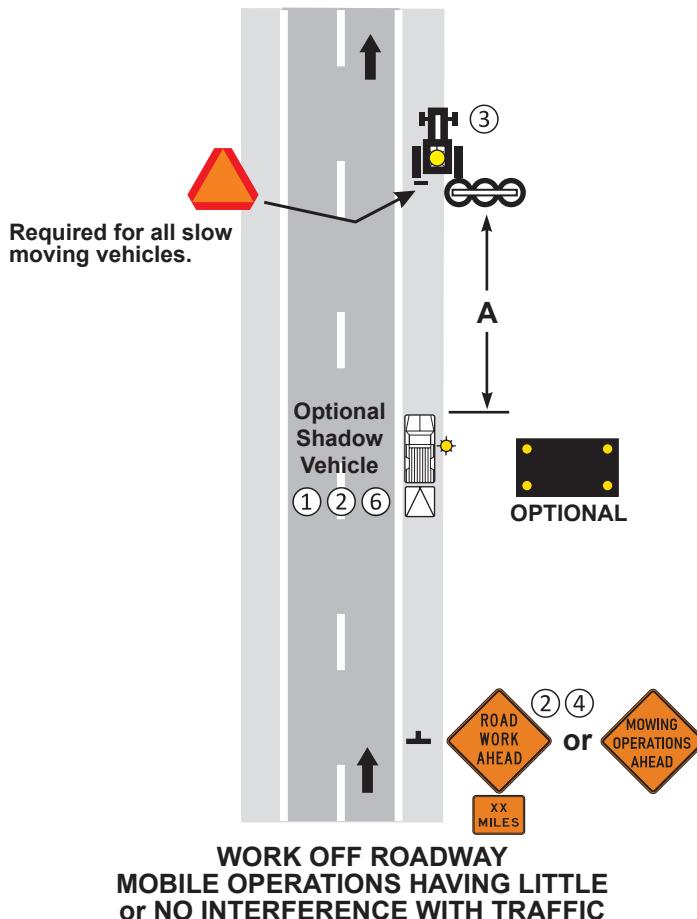
- ① Any Shadow Vehicle or Protection Vehicle operating totally or partially in a traffic lane shall be equipped with a TMA.
- ② The Shadow Vehicle or Protection Vehicle may encroach into the traffic lane when the shoulder is too narrow to drive on. If the Work and Shadow Vehicle do not encroach into the traffic lanes, the Shadow Vehicle is optional at 40 mph or less.
3. Any vehicle not displaying an Arrow Board shall display high-intensity rotating, flashing, oscillating, or strobe lights.
- ④ The PCMS shall be used for nighttime operations.
- ⑤ When the PCMS is used, the SHOULDER WORK sign becomes optional.
- ⑥ The distance between the work area and the Shadow Vehicle should be adjusted between R and L based on traffic volume and sight distance.
7. Sign Placement should be on same side work is on. Sign Placement should be on same side work is on.



LAYOUT 7

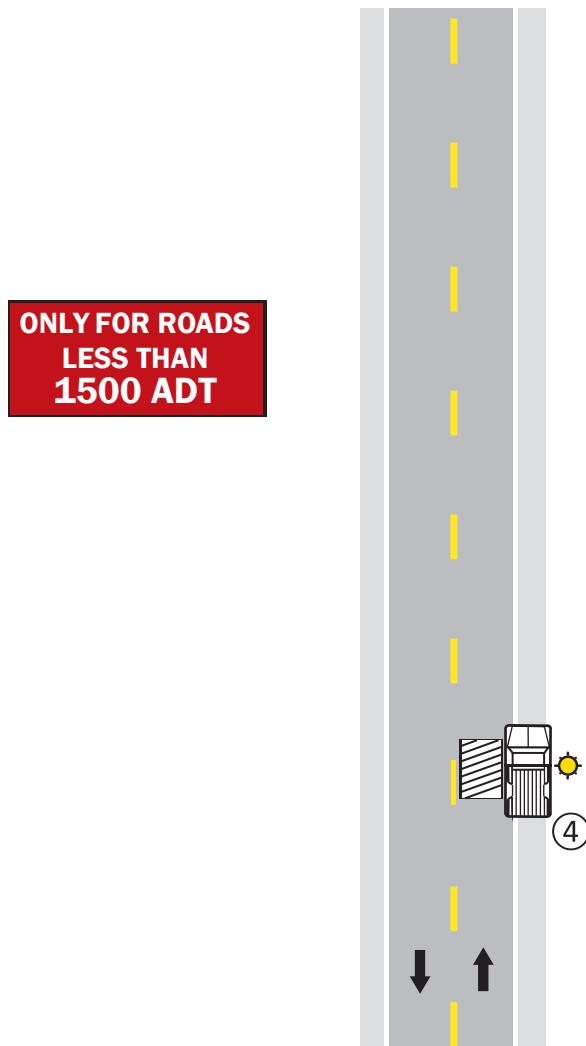
NOTES:

- ① A Shadow Vehicle may be used on roadways where Decision Sight Distance (D) is frequently restricted and the equipment consistently encroaches within 3 feet of the traffic lane.
- ② On roadways of less than 400 ADT, the Shadow Vehicle and ROAD WORK AHEAD sign may be omitted.
- ③ The vehicle should be as far off the roadway as possible, and shall display and operate a 360-degree flashing beacon.
- ④ The ROAD WORK AHEAD sign may be omitted when there is an adequate approach Decision Sight Distance (D) to the equipment along the majority of the route.
5. When advance warning signs are used, the signs should be no more than 3 miles from the equipment. The location of the signs should be determined by the sources of traffic, such as major cross roads. If the distance is 1 mile or greater, a XX MILES distance plaque should be used and placed directly below or on the lower side of the warning sign nearest traffic.
- ⑥ The Shadow Vehicle shall be equipped with a TMA if it encroaches into the traffic lane.



NOTES:

1. If the approach sight distance is restricted, a spotter should be used.
2. If the visibility is poor or the operation does not move at least the Decision Sight Distance (D) every 15 minutes, the appropriate stationary layout should be used.
3. This layout may be used for nighttime operations only in locations where the posted speed limit is 40 mph or less.
- (4) The slow moving or stopped Work Vehicle should keep the traffic lane as wide as possible by using the shoulder space whenever possible.



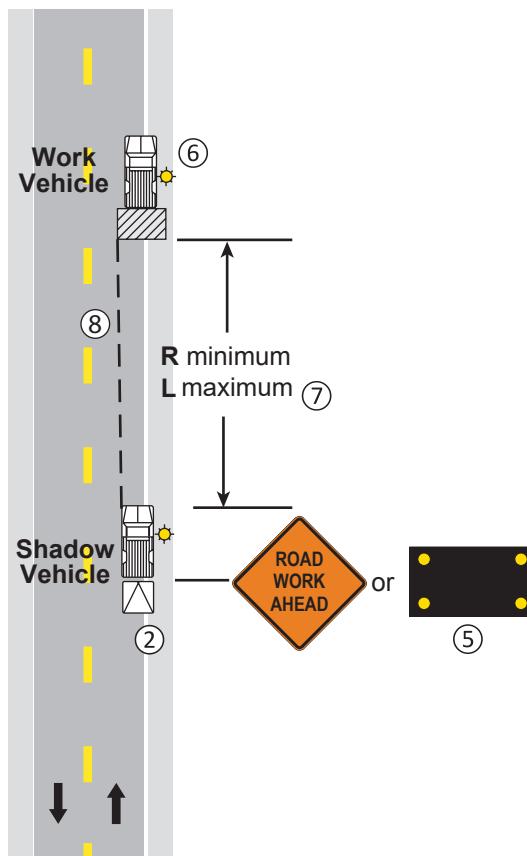
**DEBRIS REMOVAL IN LANE
TWO-LANE, TWO-WAY ROAD**

15 MINUTES or LESS

LAYOUT 9

NOTES:

1. Use Layout 11 under any of the following conditions:
 - If the work space is not visible for at least the Decision Sight Distance (D),
 - The motorists cannot see beyond the work space, or
 - Traffic volumes do not allow passage.
- ② Any Shadow Vehicle or Protection Vehicle operating totally or partially in a traffic lane shall be equipped with a TMA.
3. If the work space does not move at least the Decision Sight Distance (D) every 15 minutes, the appropriate stationary layout should be used.
4. This layout may be used for nighttime operations only in locations where the posted speed limit is 40 mph or less.
- ⑤ For nighttime operations, the Arrow Board shall be used.
- ⑥ The slow moving or stopped Work Vehicle and Shadow Vehicle should keep the traffic lane as wide as possible by using the shoulder space whenever practical.
- ⑦ The distance between the work area and the Shadow Vehicle should be adjusted between R and L based on traffic volume and sight distance.
- ⑧ Line left side of shadow vehicle with edge of work area.

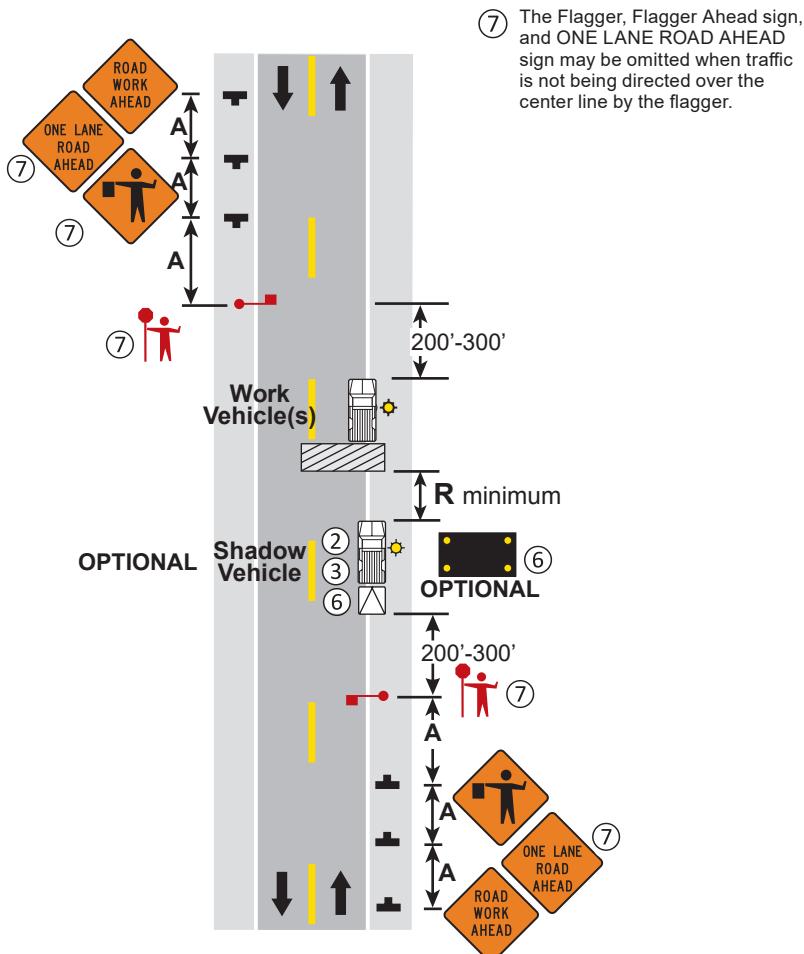


15 MINUTES or LESS

LAYOUT 10

NOTES:

1. The advance warning signs should be moved or reset after each major road intersection or after 3500 feet, whichever comes first.
- ② Any Shadow Vehicle or Protection Vehicle operating totally or partially in a traffic lane shall be equipped with a TMA.
- ③ The slow moving or stopped Work Vehicle(s) and Shadow Vehicle should keep the traffic lane as wide as possible by using the shoulder space whenever practical.
4. If the work area does not move at least the Decision Sight Distance (D) every 15 minutes, the appropriate stationary layout should be used.
5. This layout may be used for nighttime operations only in locations where the posted speed limit is 40 mph or less.
- ⑥ The Shadow Vehicle with Arrow Board shall be used during nighttime operations.



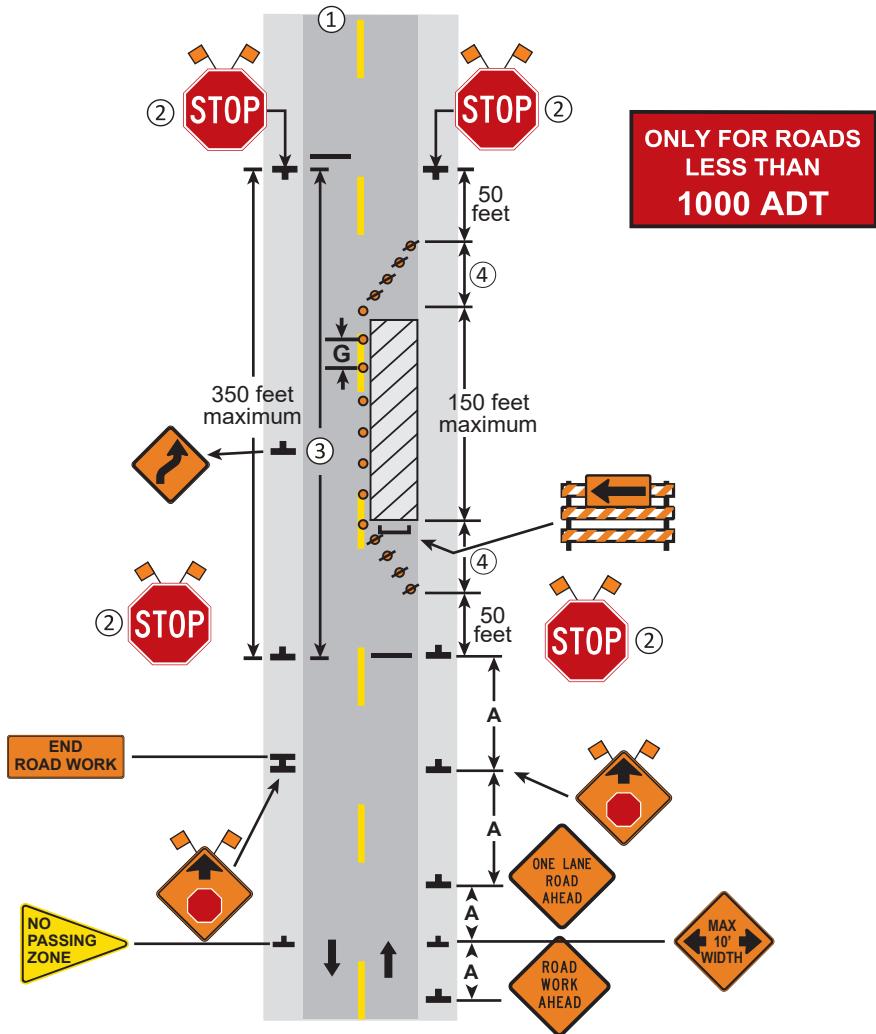
**LANE CLOSURE WITH A MOVING WORK AREA
TWO-LANE, TWO-WAY ROAD**

1 HOUR or LESS

LAYOUT 11

NOTES:

- ① Approach signs are the same in both directions.
- ② STOP signs shall be 36 x 36 inches.
- ③ If adequate sight distance is not available to recognize a stopped vehicle or traffic volume restricts vehicles from taking turns through the open lane, use Layout 15 or 22.
- ④ The two-way taper should be 50 feet in length using 5 equally spaced channelizing devices.
5. END ROAD WORK sign should be placed 500 feet past work area.
6. When available width is less than 16 feet a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



LANE CLOSURE WITH STOP SIGNS
TWO-LANE, TWO-WAY ROAD

3 DAYS or LESS

LAYOUT 12

NOTES:

- The first advance warning sign should typically be located in advance of the anticipated traffic backup or queue.
- When a side road or ramp intersects the facility on which the work is being performed, additional traffic controls shall be provided.

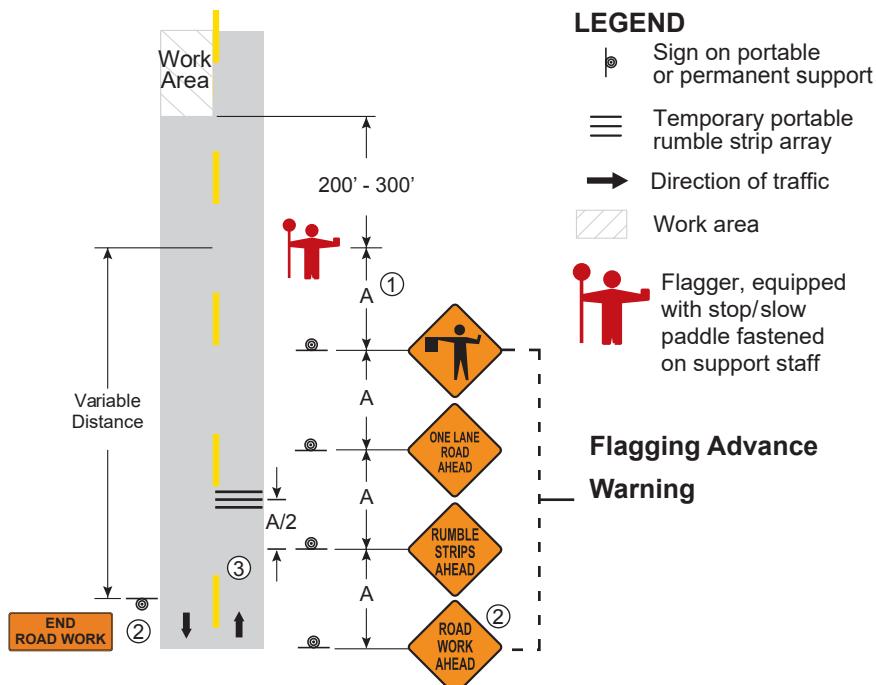
FLAGGING

- When the flagging operation is not in effect, remove temporary portable rumble strips prior to covering or removing all advance signing.

- ① For moving work operations, post additional W20-7a flagger signs at approximately 3,500' intervals in the moving work operation.
- ② Sign not required if flagging operation occurs within a signed road work zone area.
 - The Flagger may be equipped with an air horn.
 - STOP/SLOW paddle sign size is minimum of 18" x 18"

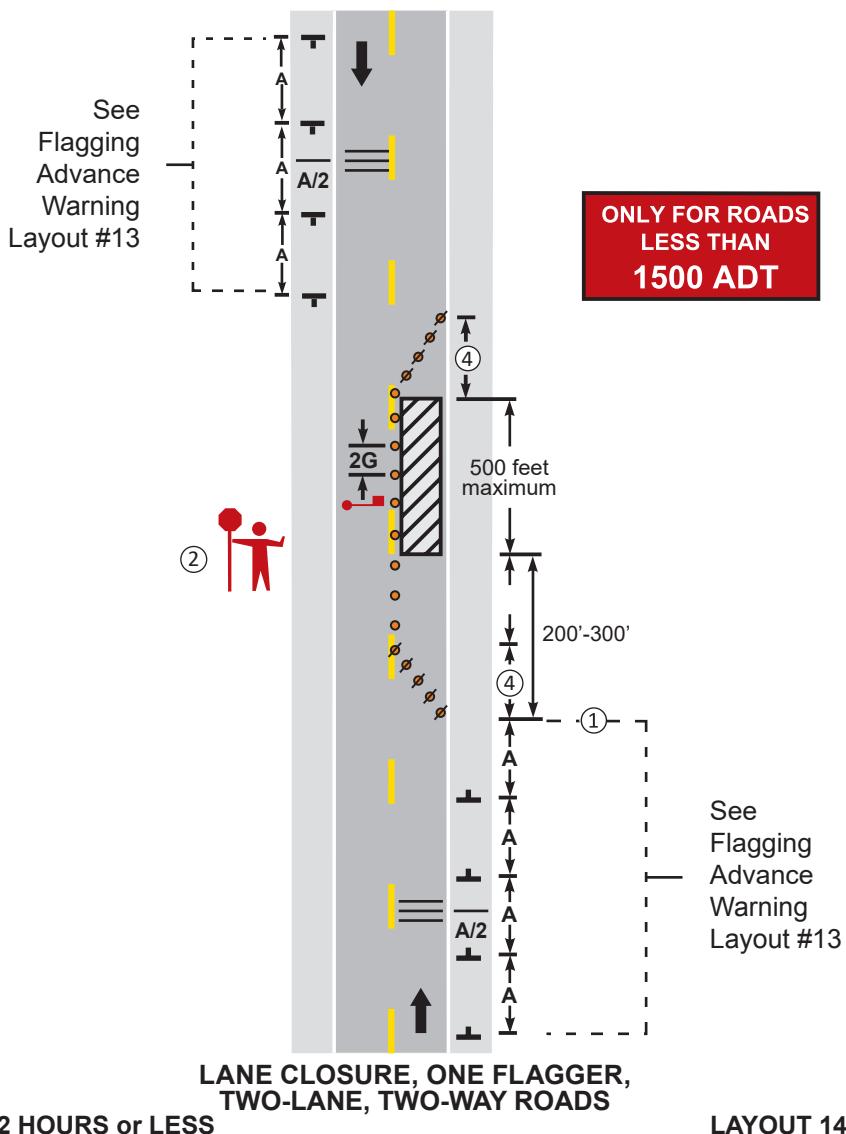
TEMPORARY PORTABLE RUMBLE STRIPS

- Utilize temporary portable rumble strips on all flagging operations that last longer than 60 minutes.
- ③ Each temporary portable rumble strip array consists of three rumble strips placed perpendicular to the direction of travel according to manufacturers recommendation, placed transverse across the lane at locations shown.
 - Only use temporary portable rumble strips from the approved products list.
 - Place advance signing prior to installing temporary portable rumble strips.
 - Do not install temporary portable rumble strips on gravel, milled surfaces, or asphalt that has been paved for less than 12 hours.
 - Temporary portable rumble strips are not required on roadways with posted speed limits of 35 mph or less.

**GENERAL FLAGGING NOTES****12 HOURS or LESS****LAYOUT 13**

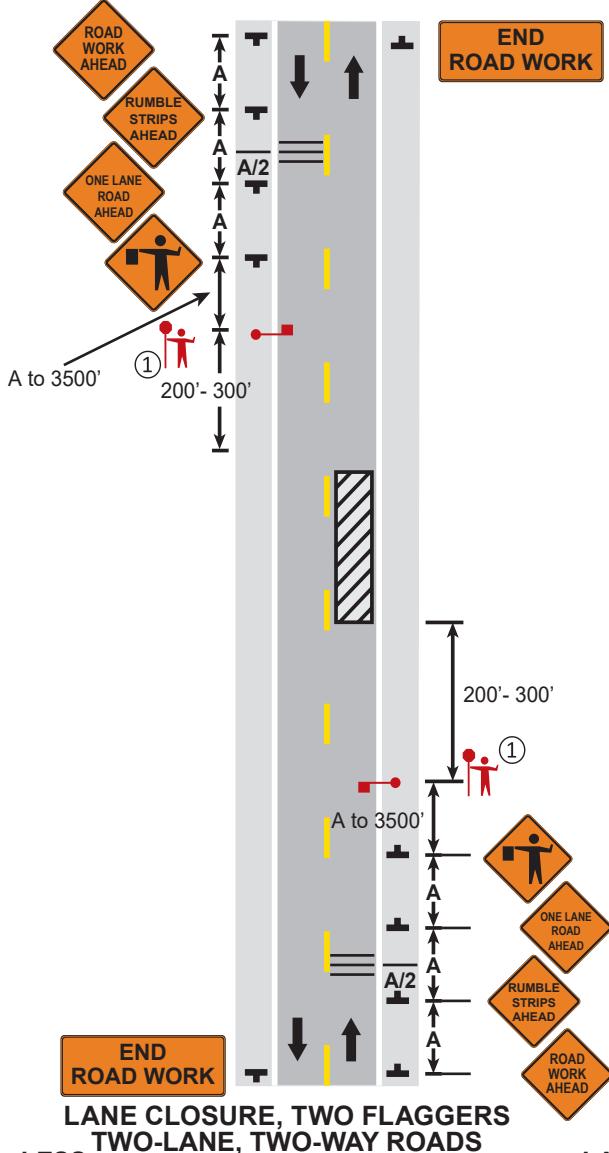
NOTES:

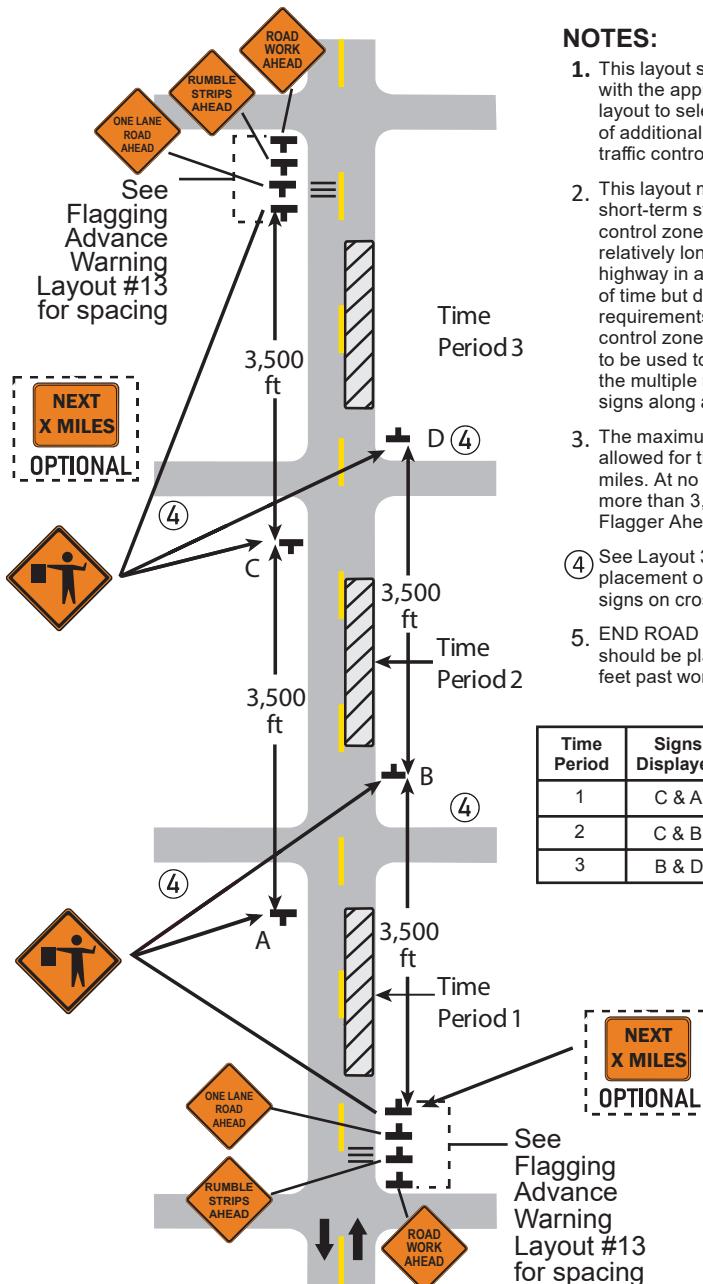
- ① The approach sight distance to the flagger shall be at least the Decision Sight Distance (D).
- ② If the flagger's ability to see oncoming motorists beyond the work space is less than the Decision Sight Distance (D), two flaggers shall be used.
3. If the work space must be left unattended at night use Layout 12.
- ④ The two-way taper should be 50 feet in length and using 5 equally spaced channelizing devices.
5. END ROAD WORK sign should be placed 500 feet past work area.



NOTES:

- ① The approach sight distance to the flagger shall be at least the Decision Sight Distance (D).
2. The two-way taper should be 50 feet in length using 5 equally spaced channelizing devices, if used.
3. If anticipating operational problems, the use of a Pilot Car (see Layout 17) may improve operations and safety. If space between flaggers exceeds two miles, use a pilot car.
4. END ROAD WORK sign should be placed 500 feet past work area.





Time Period	Signs Displayed	Signs Not Displayed
1	C & A	B & D
2	C & B	A & D
3	B & D	A & C

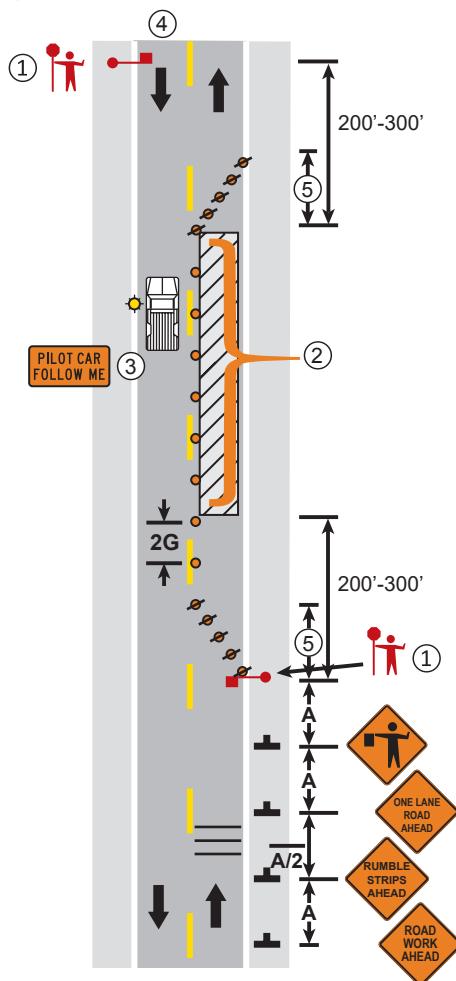
MOVING WORK SPACES

12 HOURS or LESS

LAYOUT 16

NOTES:

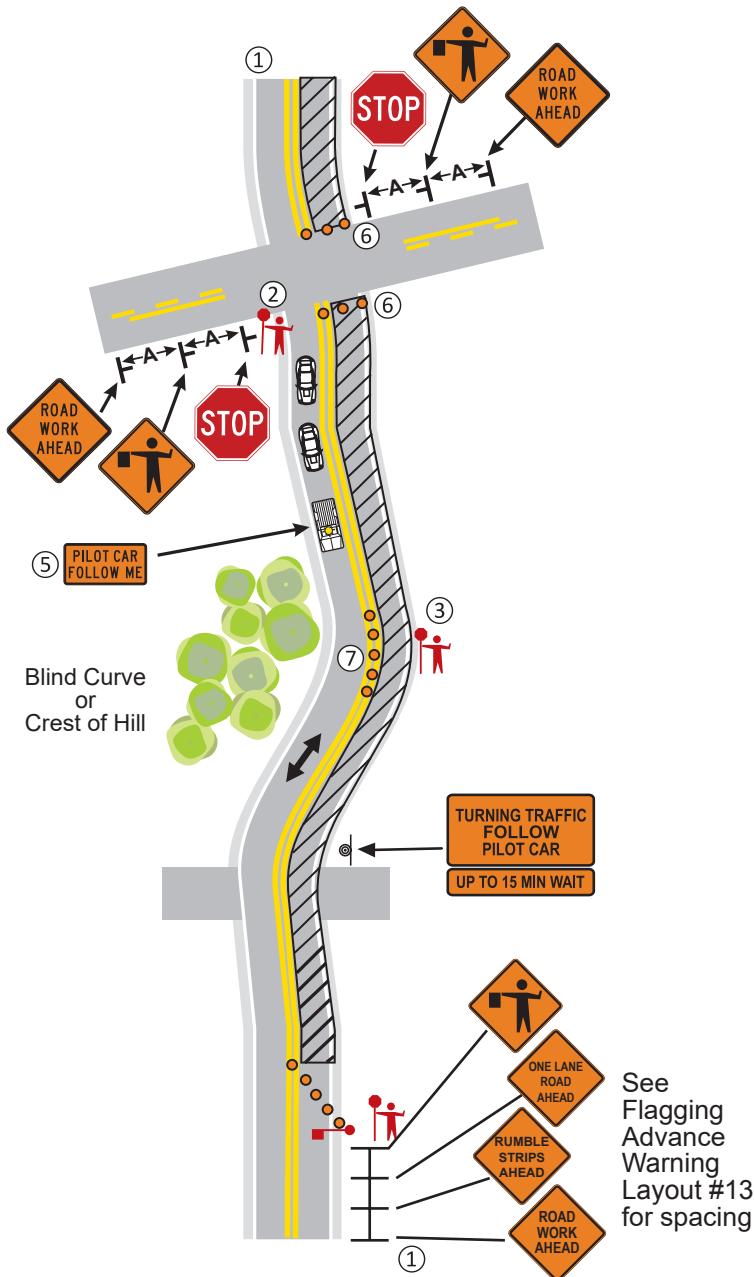
- ① The approach sight distance to the flagger shall be at least the Decision Sight Distance (D).
- ② Channelizing devices along the edge of the work space may be omitted.
- ③ Pilot Cars should lead traffic through the work zone at a reasonable speed. See the Flagging Handbook for additional guidance.
- ④ Advance warning signs are the same for both directions approaching the work area.
- ⑤ The two-way taper should be 50 feet in length using 5 equally spaced channelizing devices, if used.
6. See Layout 18 for additional considerations if there are crossroads.
7. END ROAD WORK sign should be placed 500 feet past work area.



**LANE CLOSURE, PILOT CAR METHOD
TWO-LANE, TWO-WAY ROADS**

12 HOURS or LESS

LAYOUT 17



FLAGGING CROSSROADS AND BLIND CURVES PILOT CAR OPERATIONS

12 HOURS or LESS

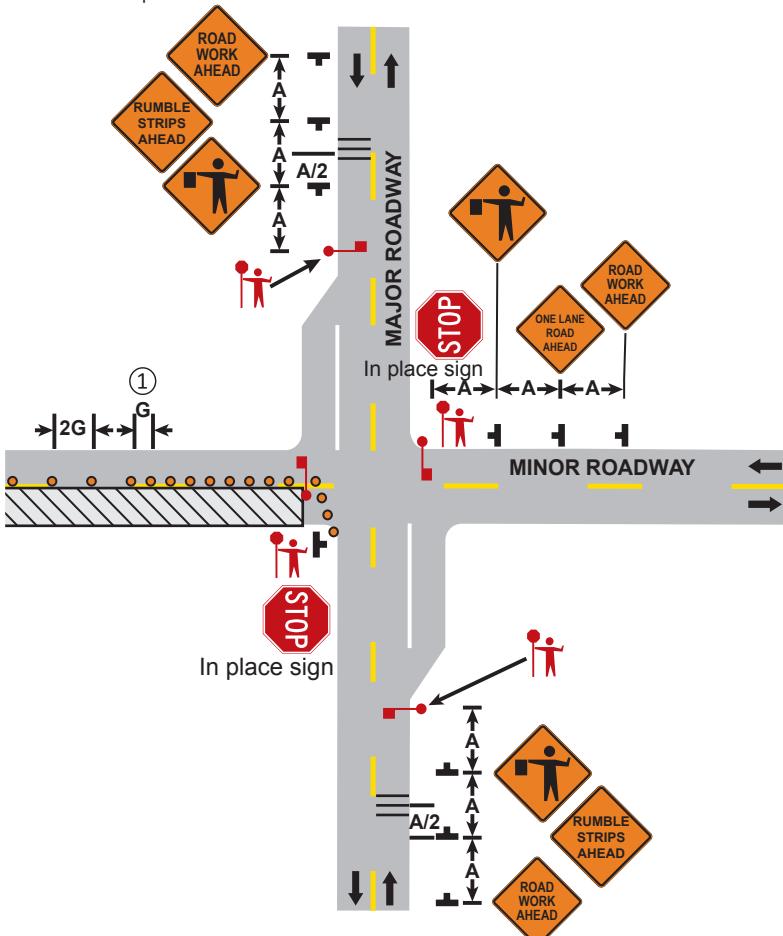
LAYOUT 18

NOTES:

- ① See Layout 13 for advance signing and flagger setup.
Approach signs are the same in both directions.
- ② When a flagger is positioned at an intersection, they:
 - Shall have 2-way communications with the Pilot Car,
 - Should use hand signals with a flag or flashlight with red glow cone to control traffic movements rather than the typical STOP/SLOW paddle in order to avoid displaying the SLOW paddle to the opposite approach, and
 - May need additional flaggers to direct traffic when the crossroad consistently has multiple vehicles per direction waiting each Pilot Car cycle.
- ③ A flagger may be placed at a blind curve, crest of a hill, or other site obstruction where traffic might enter from other driveways or entrances to warn the Pilot Car that there may be oncoming traffic. When used, the flagger:
 - Shall be located to clearly see traffic from both directions,
 - Shall not be positioned in the open traffic lane,
 - Shall have 2-way communications with the Pilot Car,
 - Shall have a flagger paddle; and
 - Should have a means to warn an errant driver such as an air horn.
4. Consider distributing brochures to local businesses and residents detailing Pilot Car operations.
- ⑤ PILOT CAR FOLLOW ME sign shall be mounted on the Pilot Car.
- ⑥ Channelizers should be placed near intersections and flagging stations.
- ⑦ Channelizers are optional with Pilot Car operations.
8. END ROAD WORK sign should be placed 500 feet past work area.

NOTES:

- ① The spacing between devices should be reduced to **G** or less when the work space is within 300 feet of the intersection. This will help keep motorists from entering into the work space near the intersection.
2. When the traffic volume of the minor roadway exceeds 1500 ADT or turning movements cause unsafe operations, the following steps should be considered:
 - a. Restrict vehicle turns from the major roadway with flagging, signing, and/or closing the turn lanes; or
 - b. Completely close a leg of the minor roadway until the work space has left the area near the intersection.
3. END ROAD WORK sign should be placed 500 feet past work area.
4. When available width is less than 16 feet a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



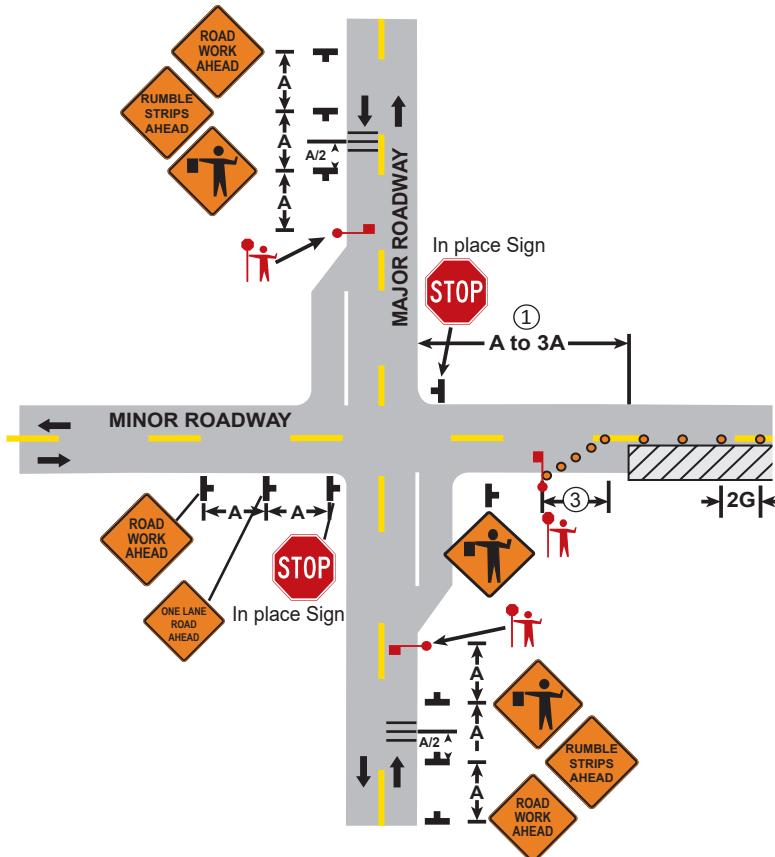
**LANE CLOSURE ON MINOR ROAD
BEFORE INTERSECTION OF MAJOR ROAD
TWO-LANE, TWO-WAY ROAD**

12 HOURS or LESS

LAYOUT 19

NOTES:

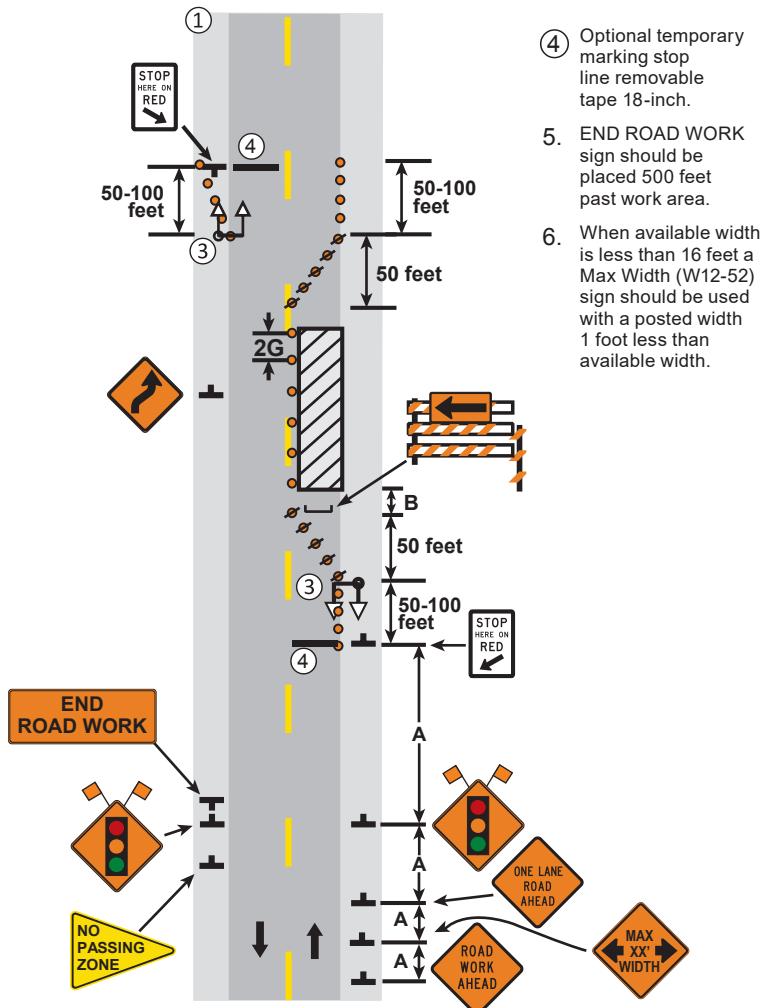
- ① When the work space is located between A and 3A beyond a controlled intersection, the normal sign and buffer spacing in the approach area may be reduced during daylight operations. The Flagger Ahead sign should be centered between the flagger station and the intersection.
2. When the traffic volume of the minor roadway exceeds 1500 ADT or turning movements cause unsafe operations, the following steps should be considered:
 - a. Restrict vehicle turns from the major roadway with flagging, signing, and/or closing the turn lanes; or
 - b. Completely close a leg of the minor roadway until the work space has left the area near the intersection.
- ③ The two-way taper should be 50 feet in length using 5 equally spaced channelizing devices.
4. END ROAD WORK sign should be placed 500 feet past work area.
5. When available width is less than 16 feet a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



**LANE CLOSURE ON MINOR ROAD
BEYOND INTERSECTION OF MAJOR ROAD
TWO-LANE, TWO-WAY ROAD**

NOTES:

- ① Approach signs are the same in both directions.
2. Signal timing and signal head locations shall be established by qualified personnel and approved by the road authority.
- ③ Two signal heads shall be installed per approach. The first shall be installed on the right shoulder. The second signal head may be installed on either the left shoulder or mounted overhead on the same structure as the first signal head.



**LANE CLOSURE WITH PORTABLE SIGNALS
TWO-LANE, TWO-WAY ROAD**

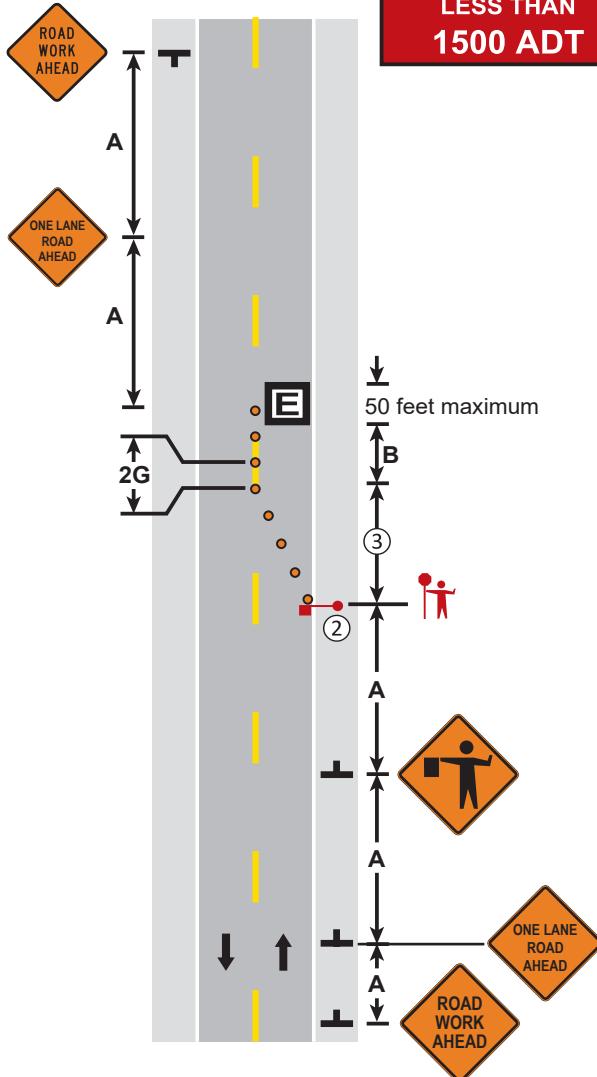
12 HOURS or LESS

LAYOUT 21

NOTES

1. Additional Work Vehicles shall be parked off of the roadway.
Do not obstruct the shoulder in the work area.
- ② The Flagger and Flagger Ahead sign may be omitted when traffic volumes do not restrict the ability of traffic to regulate itself through the length of the work space.
- ③ The two-way taper should be 50 feet in length using 5 equally spaced channelizing devices.

**ONLY FOR ROADS
LESS THAN
1500 ADT**



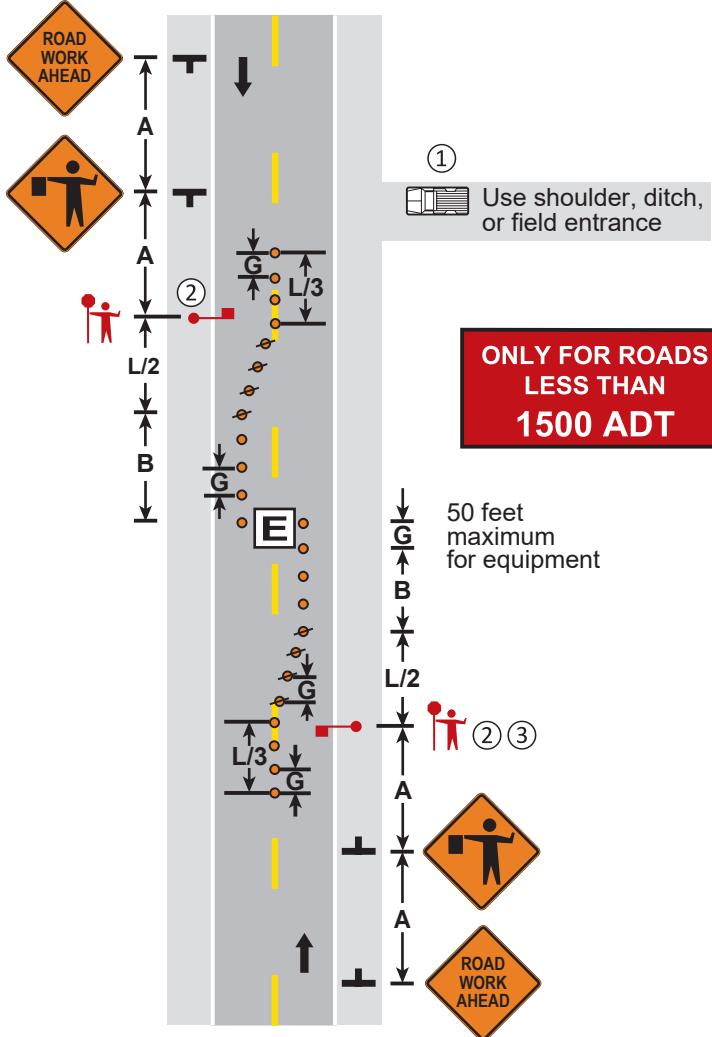
**EQUIPMENT IN TRAFFIC LANE
TWO-LANE, TWO-WAY ROAD**

1 HOUR or LESS

LAYOUT 22

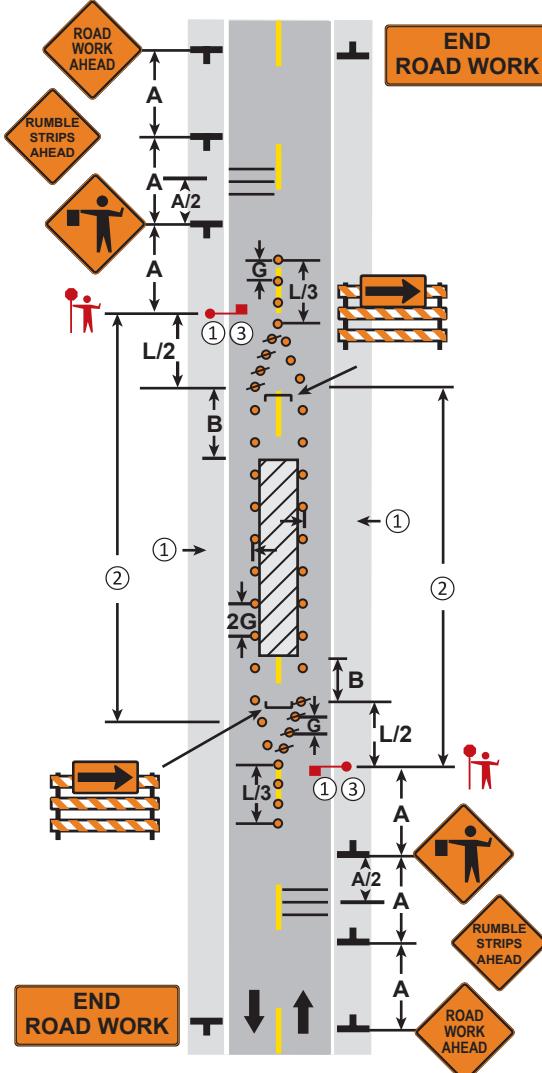
NOTES:

- ① The Work Vehicle shall be parked off of the roadway.
Do not obstruct the shoulder in the work areas.
- ② The Flaggers and the Flagger Ahead signs may be omitted if the posted speed limit is 40 mph or less and there is at least 10 feet of drivable surface outside of the channelizing devices.
- ③ The flagger shall be visible for at least the Decision Sight Distance (D).
4. Flaggers are used for set up only. Remove Flagger Ahead signs when not flagging.
5. When available width is less than 16 feet a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.

**1 HOUR or LESS****EQUIPMENT ON CENTERLINE
TWO-LANE, TWO-WAY ROAD****LAYOUT 23**

NOTES:

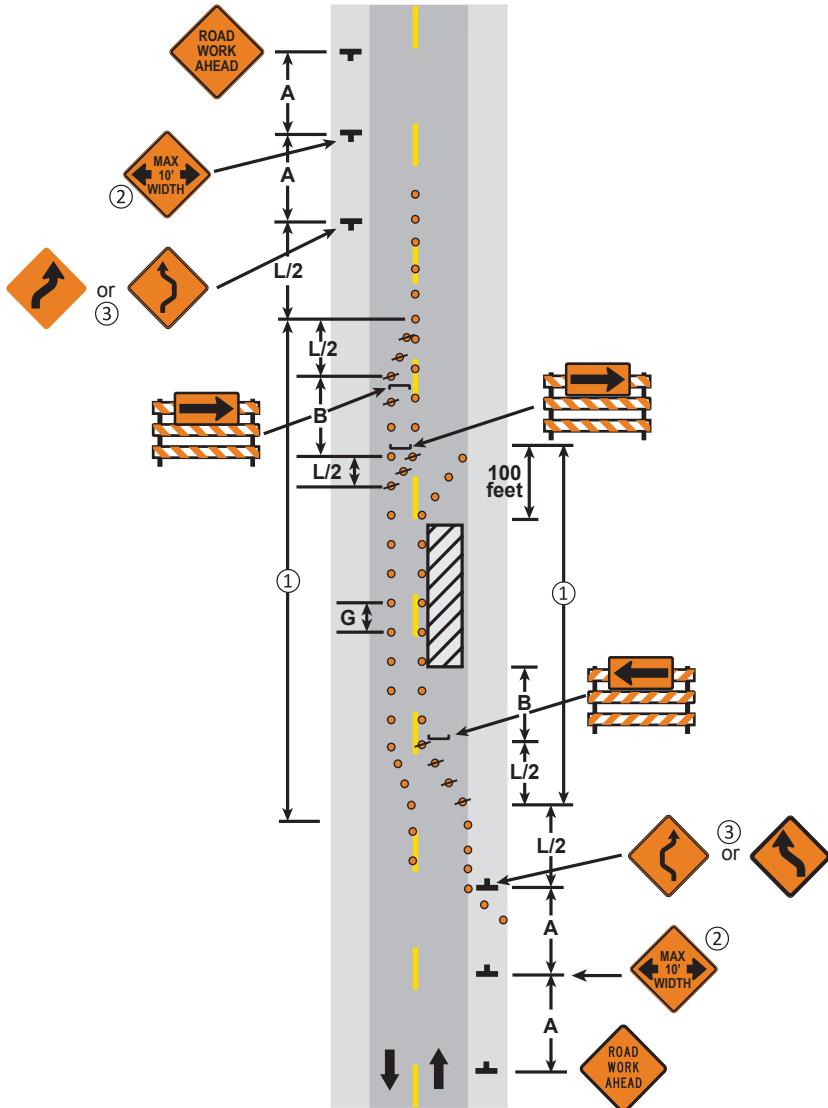
- ① The Flaggers and the Flagger Ahead signs may be omitted if the posted speed limit is 40 mph or less and there is at least 10 feet of drivable surface outside of the channelizing devices
- ② Parking and stopping should be prohibited along the work area and tapers.
- ③ The flagger shall be visible for at least the Decision Sight Distance (D).
4. END ROAD WORK sign should be placed 500 feet past work area.
5. When available width is less than 16 feet a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



WORK SPACE IN CENTER OF ROAD
TWO-LANE, TWO-WAY ROAD

NOTES:

- ① Parking and stopping should be prohibited along the work area and tapers.
 - ② When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.
 - ③ If tangent length of activity area is 600 feet or less, use the Double Reverse Curve sign.
4. END ROAD WORK sign should be placed 500 feet past work area.



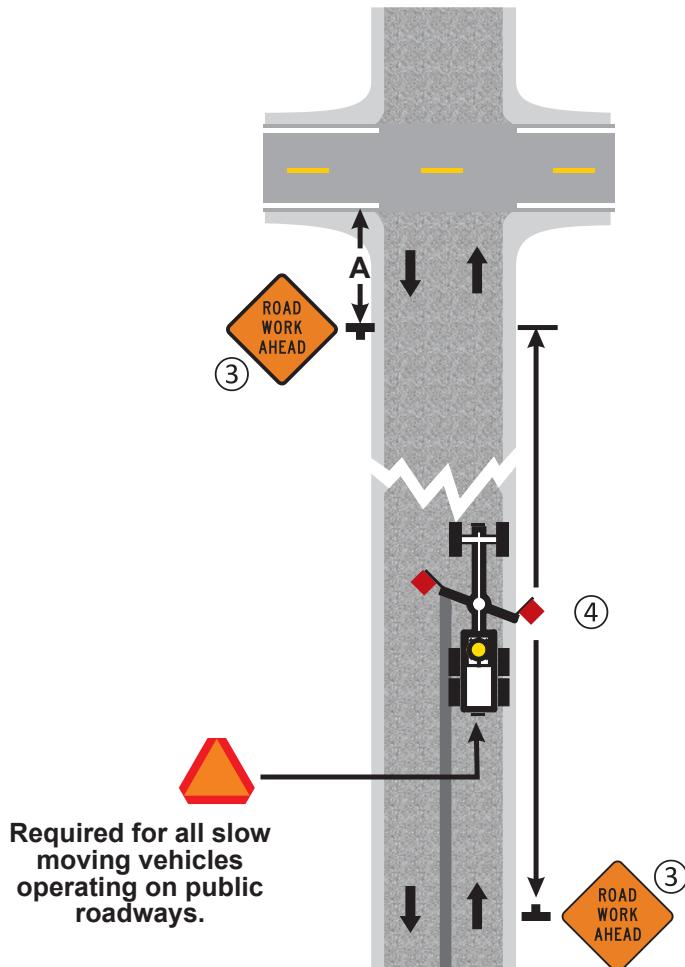
**WORK SPACE OCCUPIES ONE HALF OF ROAD
TWO-LANE, TWO-WAY ROAD**

3 DAYS or LESS

LAYOUT 25

NOTES:

1. Motor Graders shall be equipped with operating vehicle warning lights visible for 360 degrees.
2. Motor Grader blade end(s) may be marked with red or orange flags to provide additional warning and make the equipment more visible to passing vehicles.
- ③ The ROAD WORK AHEAD signs may be omitted when there is an adequate approach Decision Sight Distance (D) to the Motor Grader along the majority of the route.
- ④ When advance warning signs are used, the signs should be no more than 3 miles from the Work Vehicle. The location of the signs should be determined by the sources of traffic, such as major cross roads.
5. END ROAD WORK sign should be placed 500 feet past work area.



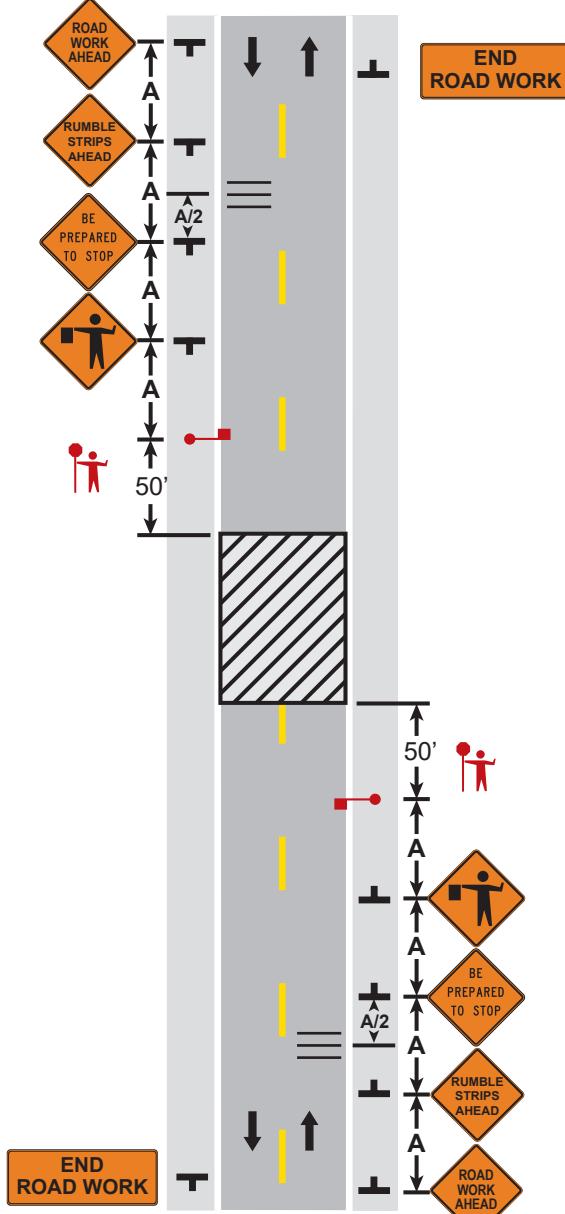
**GRAVEL ROAD MAINTENANCE
GRADING OPERATIONS
TWO-LANE, TWO-WAY ROAD**

12 HOURS or LESS

LAYOUT 26

NOTES:

- Traffic should not be stopped for intervals of greater than 15 minutes.
- END ROAD WORK sign should be placed 500 feet past work area.

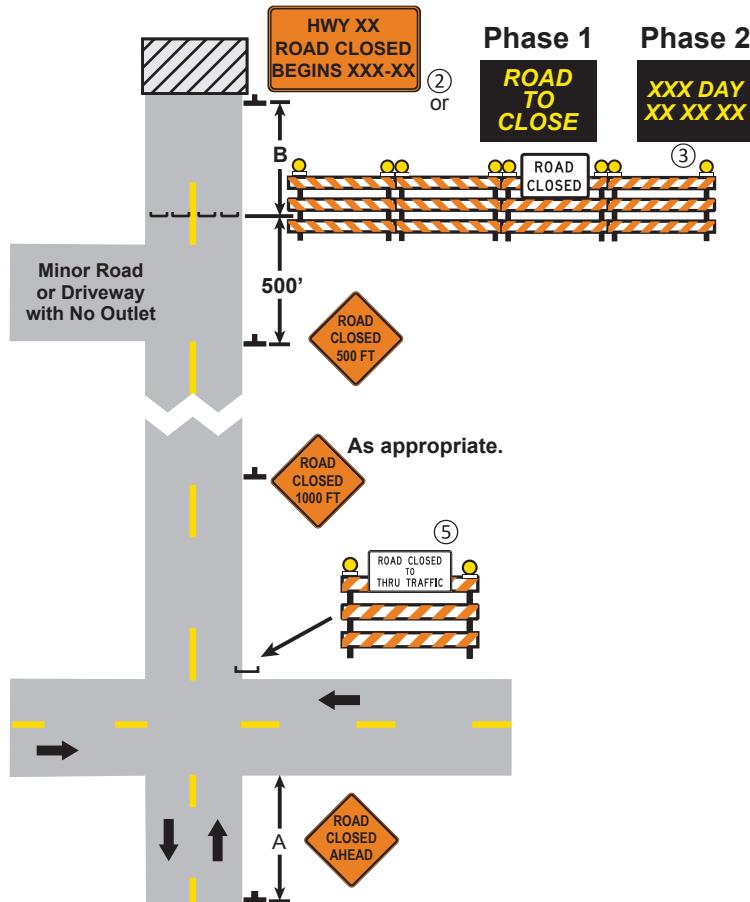


**TEMPORARY ROAD CLOSURE
12 HOURS or LESS TWO-LANE, TWO-WAY ROAD**

LAYOUT 27

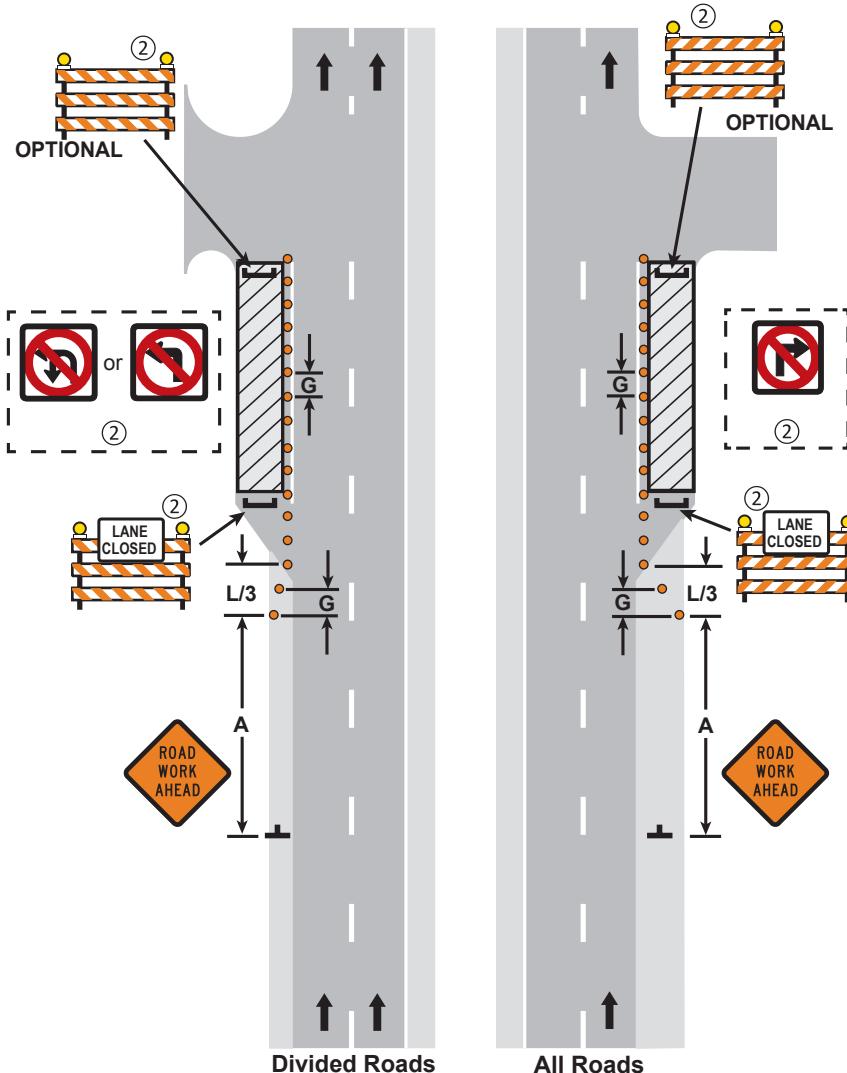
NOTES:

1. The road authority shall be contacted prior to closure. The road authority may provide requirements related to sign placement, detours, emergency services, etc.
- (2) A Road Closure Notice sign or PCMS should be installed 7 days in advance as required by the road authority.
- (3) Install Type III barricade at the last driveway or intersection beyond which there is no public access. Barricade shall span the entire roadway including traversable shoulders.
4. Road user safety and usability must be maintained up to the full closure.
- (5) ROAD CLOSED TO THRU TRAFFIC barricade assembly may be placed on the center line; stripes on barricade shall slope downward toward the appropriate traffic direction (for both directions of the roadway).
6. NO OUTLET sign shall be used only when there are no outlets and there are no alternate through routes past this point.

PCMS**ROAD CLOSURE****3 DAYS or LESS****LAYOUT 28**

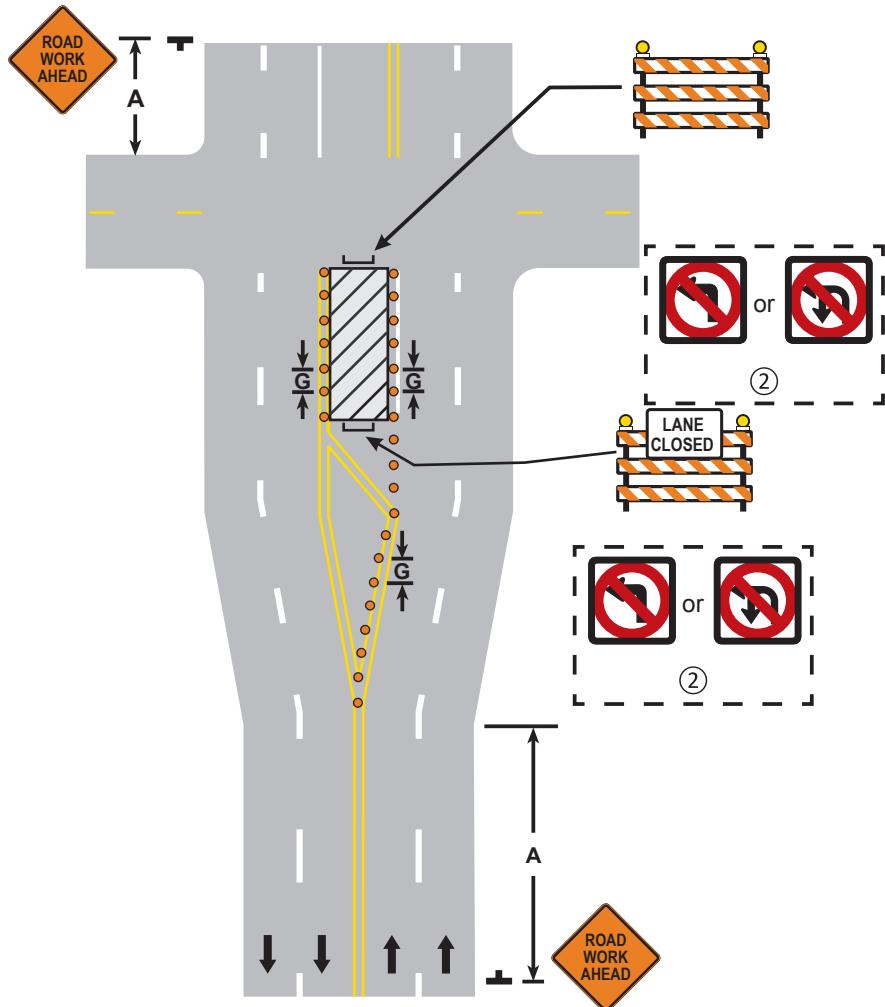
NOTES:

1. Contact the appropriate road authority for signal timing modifications before beginning work at any signalized intersection.
- (2) Signs are required if turns are prohibited.
3. END ROAD WORK sign should be placed 500 feet past work area.

**TURN LANE CLOSURES****3 DAYS or LESS****LAYOUT 29**

NOTES:

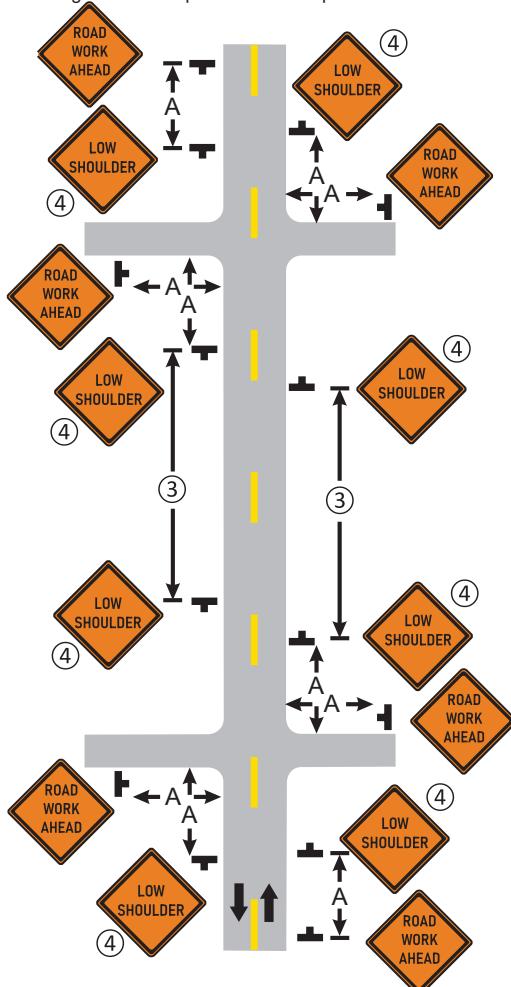
1. Contact the appropriate road authority for signal timing modifications before beginning work at any signalized intersection.
- (2) Signs are required if turns are prohibited.
3. END ROAD WORK sign should be placed 500 feet past work area.



**LEFT TURN LANE CLOSURE
TWO-LANE, TWO WAY or MULTI-LANE UNDIVIDED ROAD
3 DAYS or LESS** LAYOUT 30

NOTES:

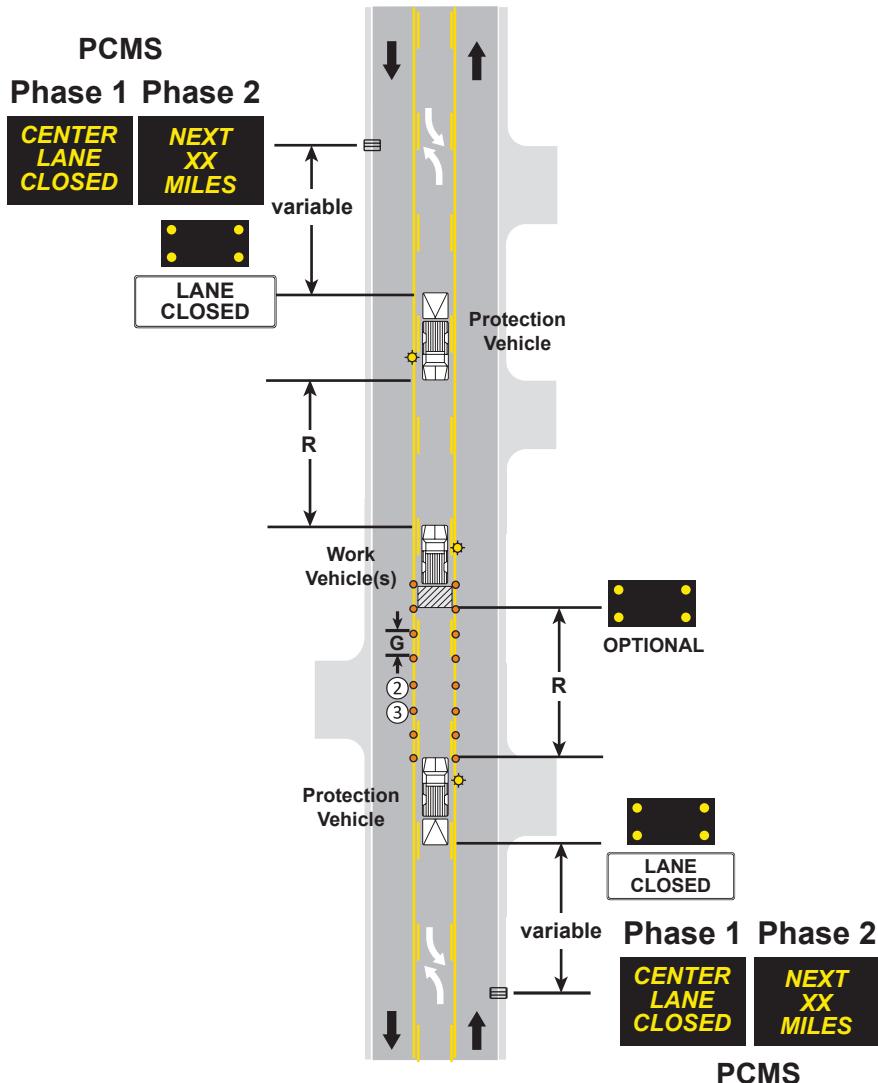
1. This layout should be used for those stationary temporary traffic control zones that extend over a relatively long segment of roadway.
2. The appropriate layout shall be used for the active work space (such as resurfacing operations, area of paving, etc).
- ③ Confirmation signing for a continuous condition should be placed after every intersection and approximately 1 mile spacing.
- ④ Use the appropriate advance warning sign for the roadway condition, i.e. GROOVED PAVEMENT, LOOSE GRAVEL, ROUGH ROAD. See Drop Off Signing on Figure 5.
5. Delineate raised structures (manhole covers, etc.)
6. END ROAD WORK sign should be placed 500 feet past work area.



TWO-WAY, CONTINUOUS LEFT TURN LANE				
Lane Closures	MOBILE 15 Minutes or Less	SHORT DURATION 1 Hour or Less	SHORT TERM 12 Hours or Less	INTERMEDIATE TERM 3 Days or Less
Two-Way, Continuous Turn Lane		32	33	
Through Lane Closure (3 Lane Section)	34			
Right Lane Closure (5 Lane Section)		37	38	
Left Lane Closure (5 Lane Section)		37	35	
Double Lane Closure (5 Lane Section)	36			

NOTES:

1. Protection Vehicles operating totally or partially in a traffic lane shall be equipped with a TMA.
- ② Channelizers may be omitted if the operation moves at least the Decision Sight Distance (D) every 15 minutes (mobile operation).
- ③ Reduce channelizing device spacing as needed to prevent turns.



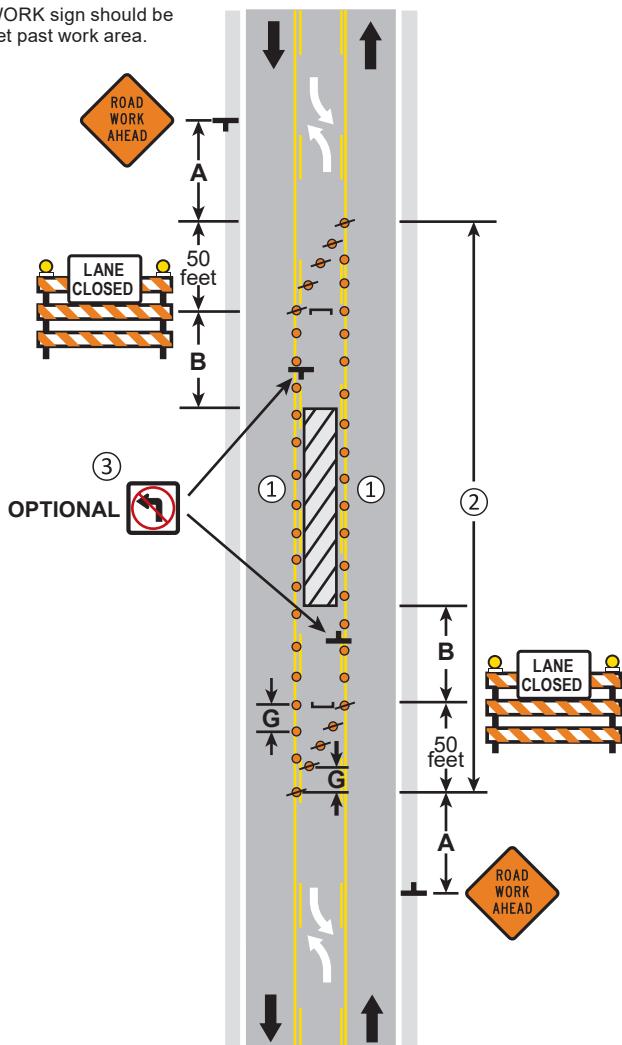
**MOBILE/SHORT DURATION LANE CLOSURE
TWO-WAY CONTINUOUS LEFT-TURN LANE**

1 HOUR or LESS

LAYOUT 32

NOTES:

- ① The minimum paved lane width from channelizing devices to edge of pavement or outside edge of paved shoulder or face of curb shall be 10 feet.
- ② Parking and stopping may be prohibited along the work space and taper.
- ③ Left turning movements should be prohibited along the work space and taper. Reduce spacing of channelizing devices as needed in order to prevent turns. No Left Turn signs may be used throughout the work space and taper as appropriate.
4. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.
5. END ROAD WORK sign should be placed 500 feet past work area.

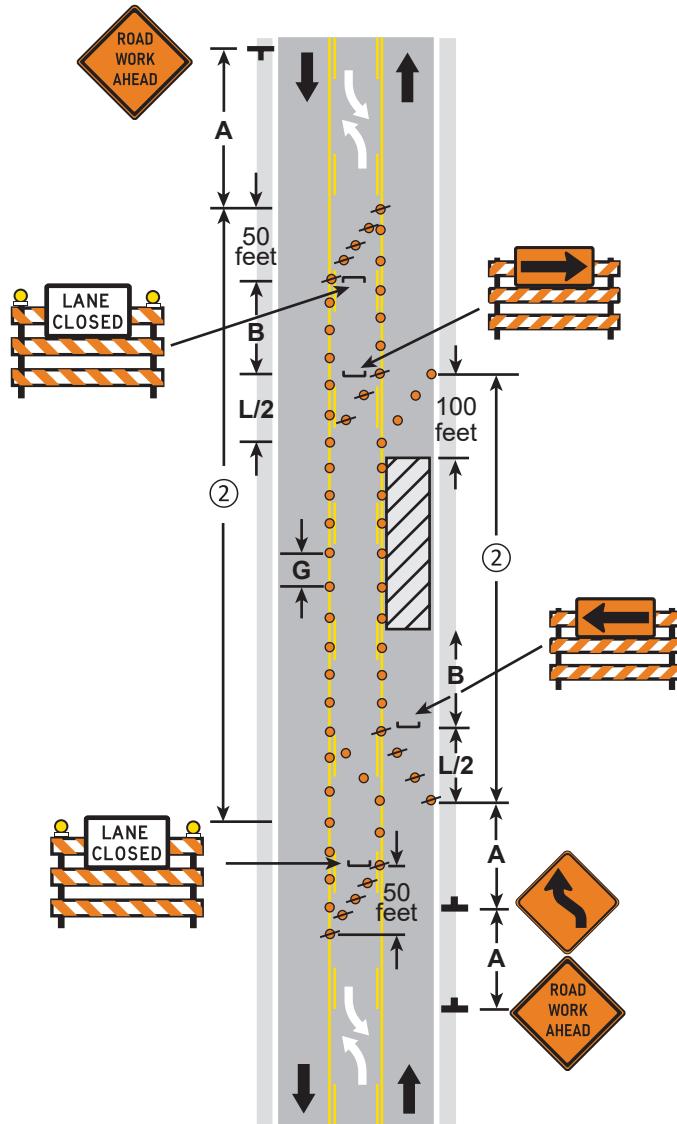


**TURN LANE CLOSURE
TWO-WAY CONTINUOUS LEFT-TURN LANE
3 DAYS or LESS**

LAYOUT 33

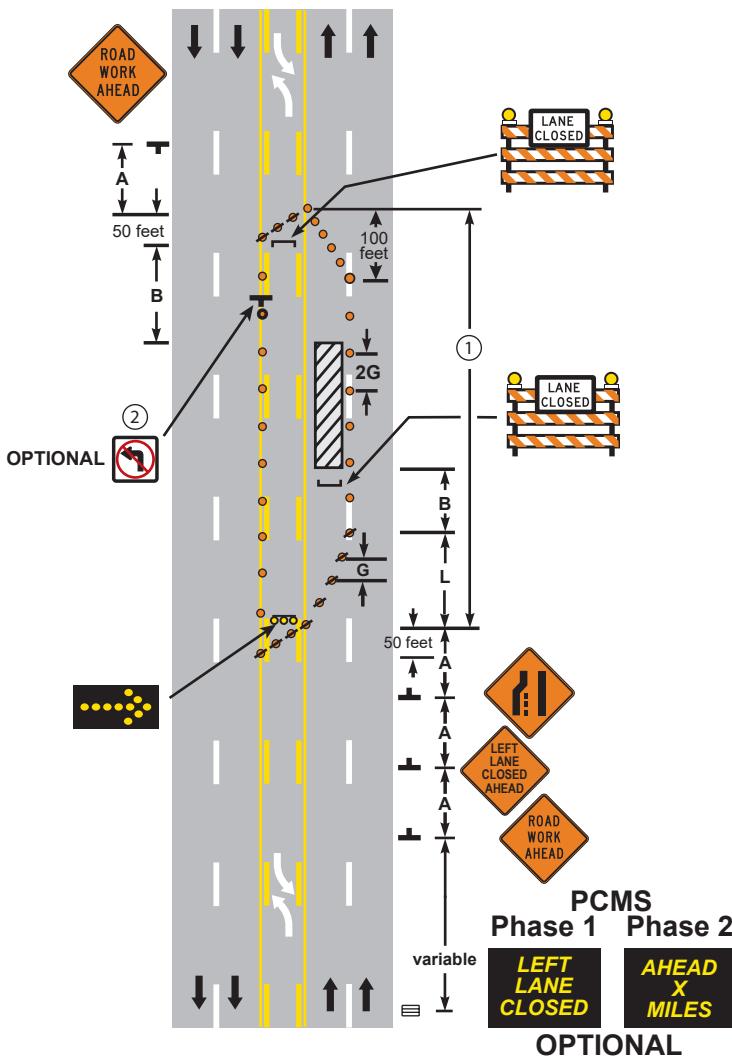
NOTES:

1. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.
- ② Parking, stopping, and left turning movements may be prohibited along the work space and taper. Reduce spacing of channelizing devices as needed in order to prevent turns.
3. END ROAD WORK sign should be placed 500 feet past work area.



NOTES:

- ① Parking and stopping may be prohibited along the work space and taper.
- ② Left-turning movements should be prohibited along the work space and taper.
Reduce spacing of channelizing devices as needed in order to prevent turns.
No Left Turn signs may be used throughout the work space and taper as appropriate.
3. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.
4. END ROAD WORK sign should be placed 500 feet past work area.



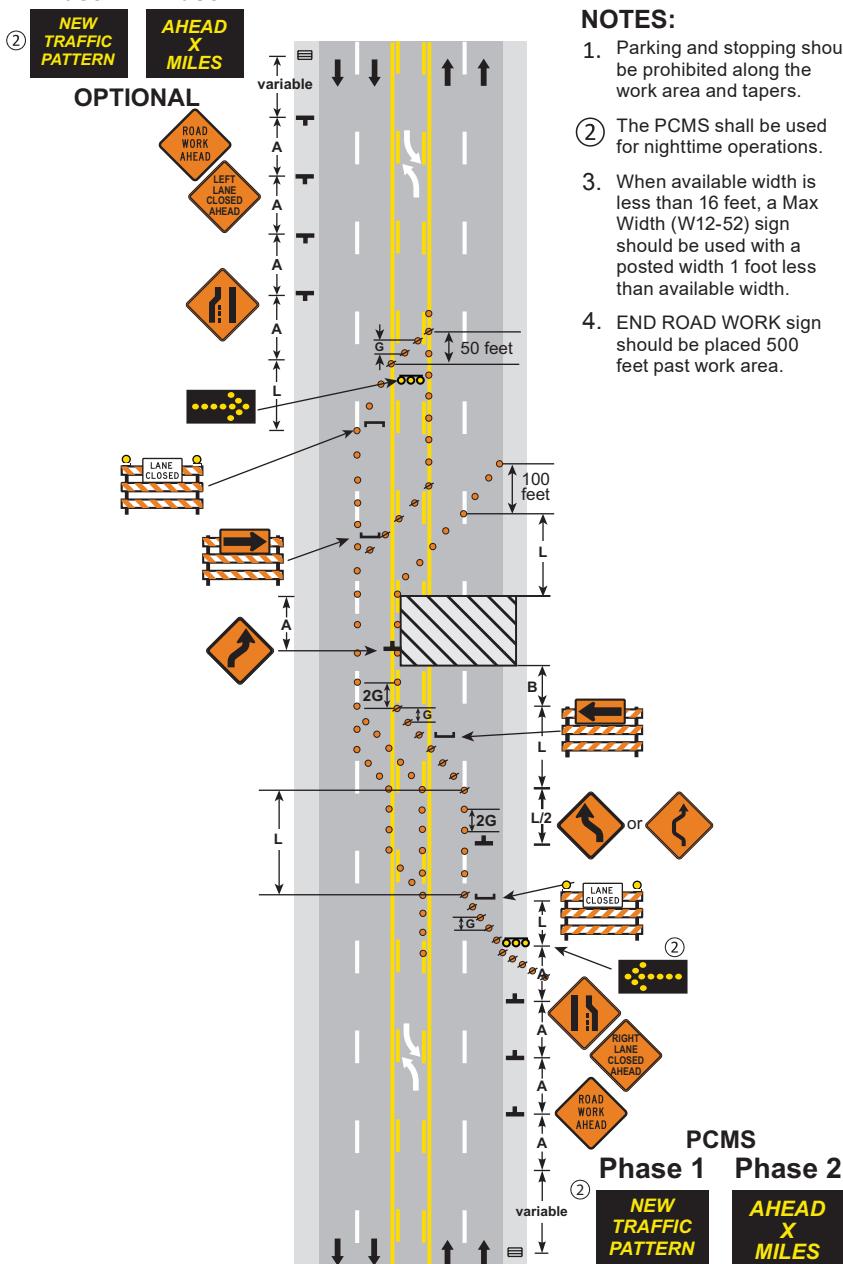
**LEFT LANE CLOSURE - 5 LANE SECTION
TWO-WAY CONTINUOUS LEFT-TURN LANE**

3 DAYS or LESS

LAYOUT 35

PCMS

Phase 1 Phase 2



**DOUBLE LANE CLOSURE - 5 LANE SECTION
TWO-WAY CONTINUOUS LEFT-TURN LANE**

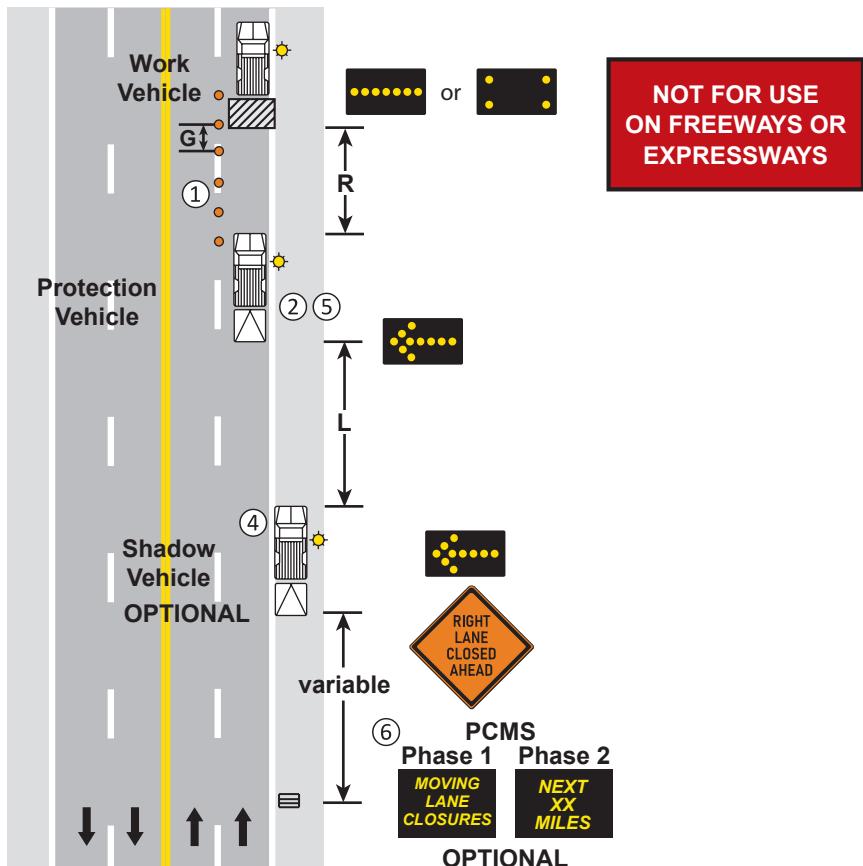
3 DAYS or LESS

LAYOUT 36

MULTI-LANE UNDIVIDED ROADS				
	MOBILE 15 Minutes or Less	SHORT DURATION 1 Hour or Less	SHORT TERM 12 Hours or Less	INTERMEDIATE TERM 3 Days Or Less
Work Vehicle Parked on Shoulder		4		6
Work on Shoulder		7		6
Work off Shoulder			6	
Work off Roadway	8			
Shoulder or Parking Lane Closure			6	
Partial Shoulder Closure for Trailer Mounted Devices			5	
Lane Closures				
Mobile/Short Duration		37		
Near Intersection	58		29, 30, 41, 42, 43	
Left Lane			39	
Right Lane			38	
Turn Lane			29, 30	
Double Lane			40	
Temporary Road Closure (15 minute intervals)		44		
Temporary Road Closure			28	
Sidewalk Closure			85, 86	
Crossroad and Confirmation Signing			31	

NOTES:

- ① Channelizing devices may be omitted if the operation moves at least the Decision Sight Distance (D) every 15 minutes or less (mobile operation).
- ② May use additional Protection Vehicle (not shown on layout) to close shoulder in advance of Work Vehicle.
3. Any Shadow Vehicle or Protection Vehicle operating totally or partially in a traffic lane shall be equipped with a TMA.
- ④ The Shadow Vehicle may encroach into the traffic lane when the shoulder is too narrow to drive on.
- ⑤ If the Shadow Vehicle is not used and there is no PCMS, the Protection Vehicle must have a RIGHT LANE CLOSED AHEAD sign.
- ⑥ The PCMS shall be used for nighttime operations.



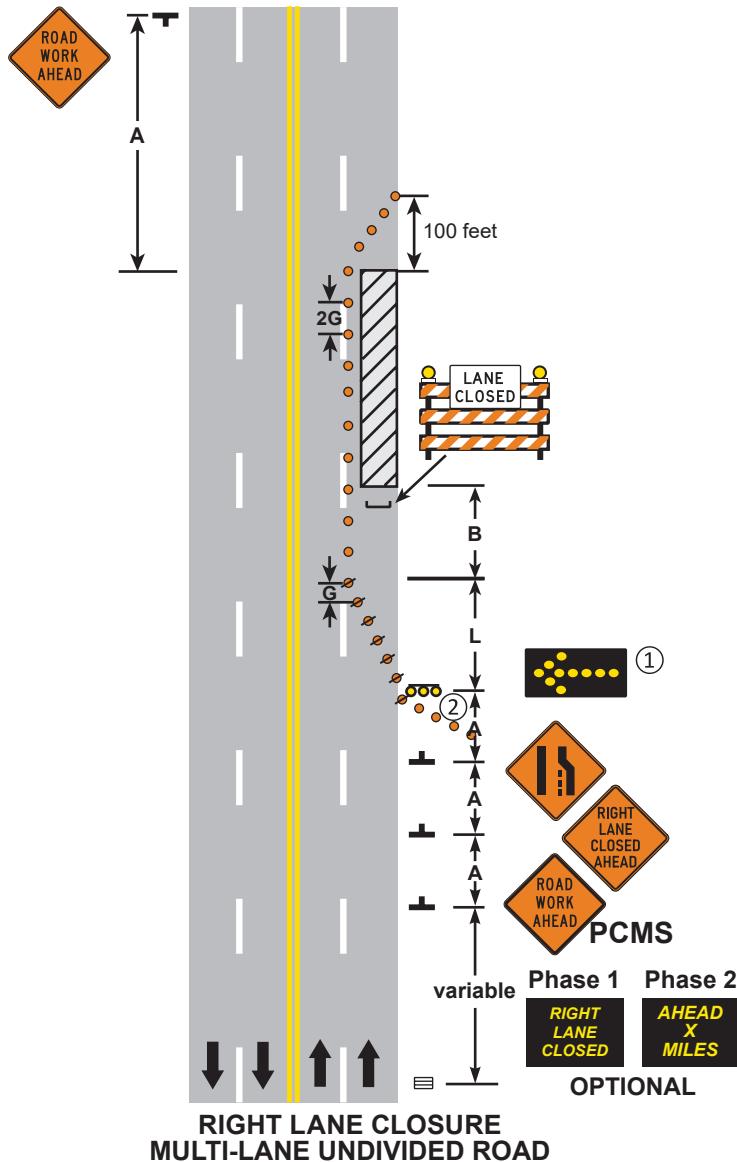
**MOBILE/SHORT DURATION LANE CLOSURE
MULTI-LANE UNDIVIDED ROAD**

1 HOUR or LESS

LAYOUT 37

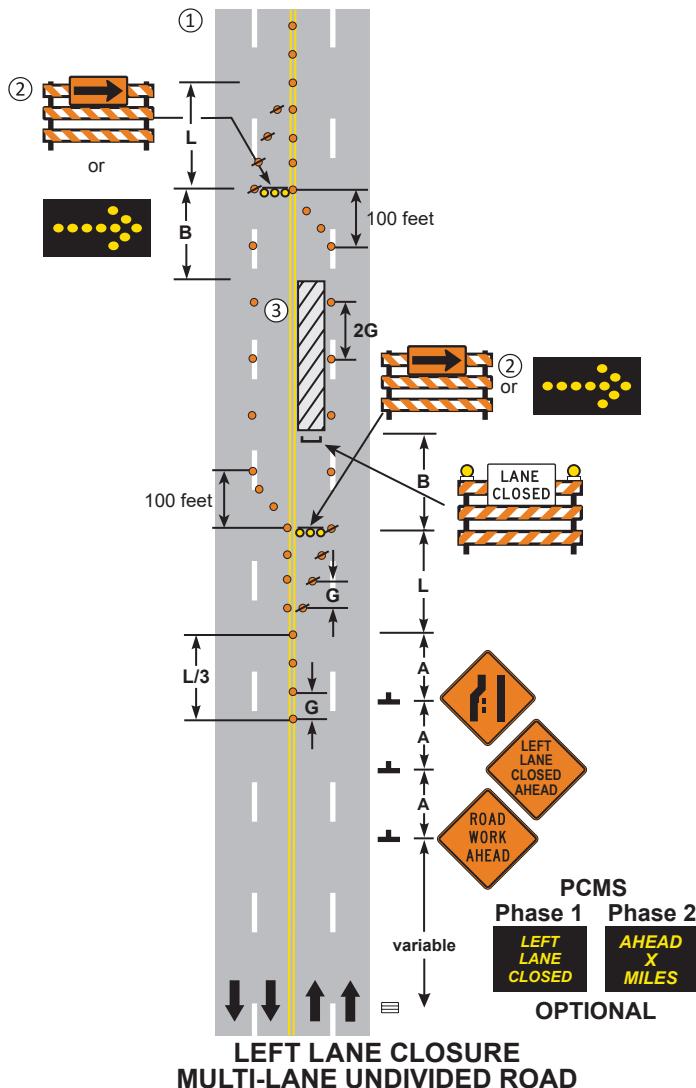
NOTES:

- ① For speeds 45 mph and greater, an Arrow Board shall be used. If Arrow Board is not used, substitute a Type III Barricade with WO1-6 Sign in lane closure taper and remove the five drum delineation.
- ② If there is a shoulder, close the shoulder using a shoulder taper.
3. END ROAD WORK sign should be placed 500 past work area.
4. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



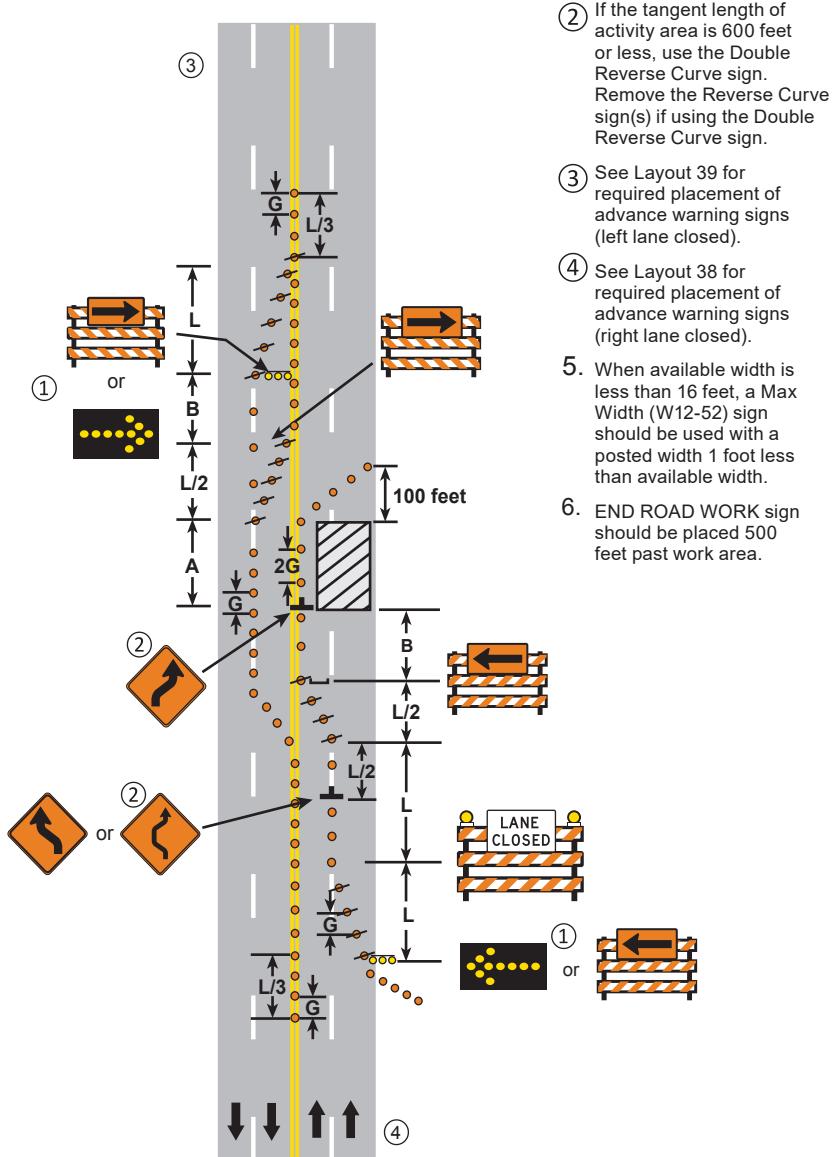
NOTES:

- ① The advance warning sign sequence is shown for one direction only.
Signing from the other direction shall be identical.
- ② For speeds 45 mph and greater, an Arrow Board shall be used. If Arrow Board is not used, substitute a Type III Barricade with WO1-6 Sign in the lane closure taper.
- ③ Lane may be opened when workers are not present in the work area.
4. END ROAD WORK sign should be placed 500 feet past work area.
5. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



NOTES:

- ① For speeds 45 mph and greater, an Arrow Board shall be used. If Arrow Board is not used, substitute a Type III Barricade with WO1-6 sign in the lane taper and remove the five drum delineation.



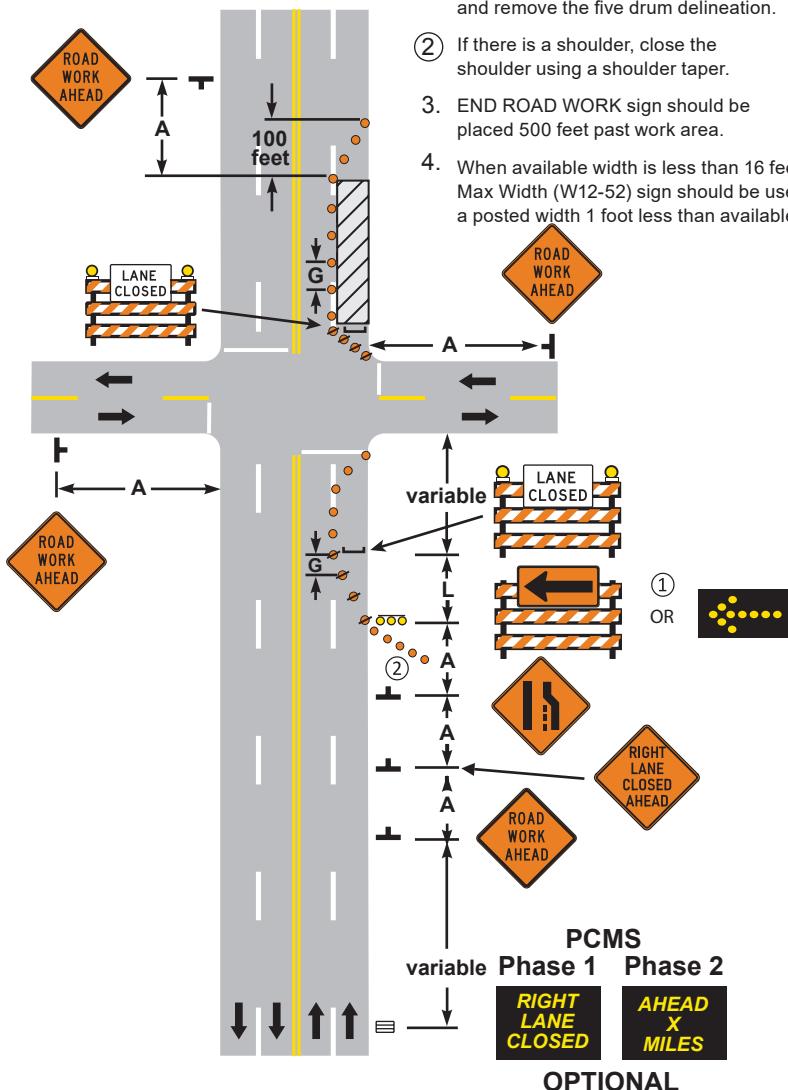
**DOUBLE LANE CLOSURE
MULTI-LANE UNDIVIDED ROAD**

3 DAYS or LESS

LAYOUT 40

NOTES:

- ① For speeds 45 mph and greater, an Arrow Board shall be used. If Arrow Board is not used, substitute a Type III Barricade with W01-6 sign in the lane closure taper and remove the five drum delineation.
- ② If there is a shoulder, close the shoulder using a shoulder taper.
3. END ROAD WORK sign should be placed 500 feet past work area.
4. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



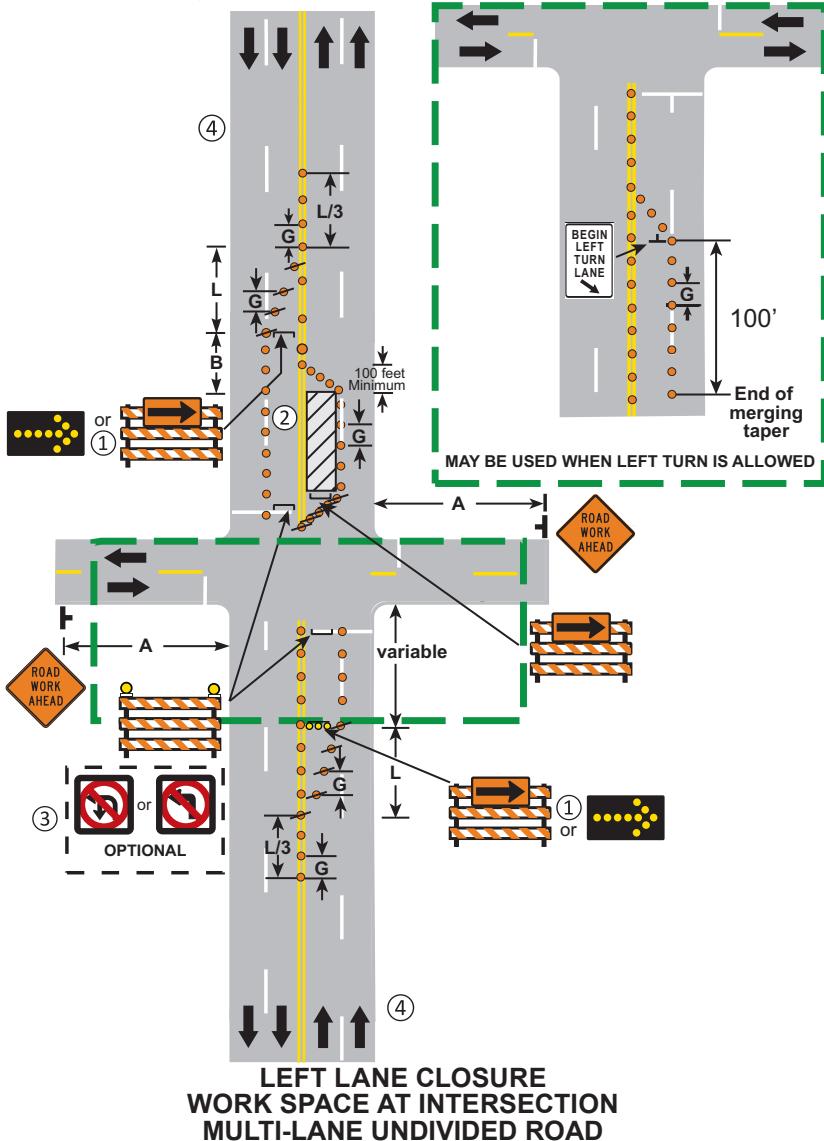
**RIGHT LANE CLOSURE
WORK SPACE AT INTERSECTION
MULTI-LANE UNDIVIDED ROAD**

3 DAYS or LESS

LAYOUT 41

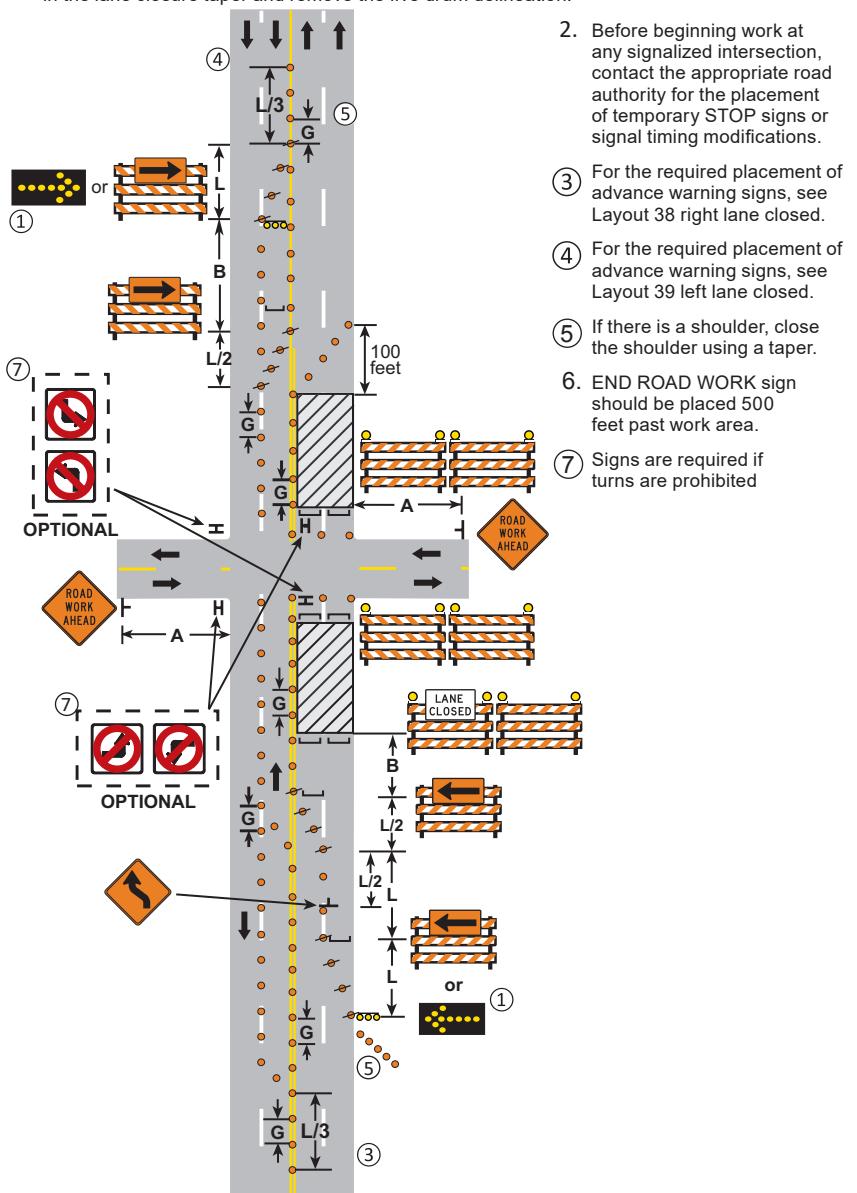
NOTES:

- ① For speeds 45 mph and greater, an Arrow Board shall be used. If Arrow Board is not used, substitute a Type III Barricade with WO1-6 sign in the lane closure taper.
- ② The lane closure may be omitted when the workers are not at the work site.
- ③ Signs are required if turns are prohibited.
- ④ See Layout 39 for required placement of advance warning signs.
5. END ROAD WORK sign should be placed 500 feet past work area.



NOTES:

- ① For speeds 45 mph and greater, an Arrow Board shall be used. If an Arrow Board is not used, substitute a Type III Barricade with WO1-6 sign in the lane closure taper and remove the five drum delineation.



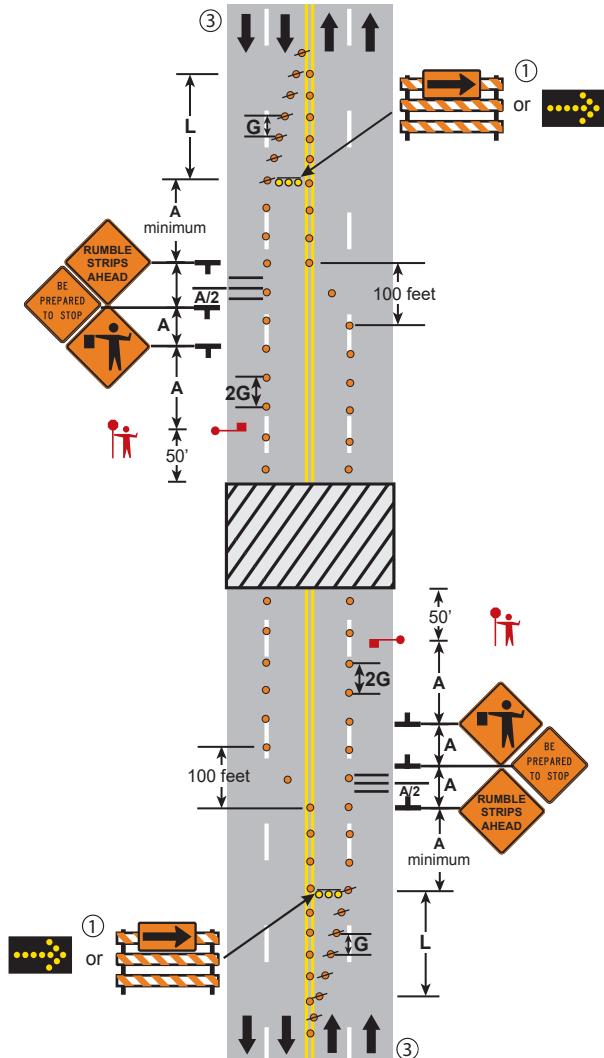
**DOUBLE LANE CLOSURE AT INTERSECTION
MULTI-LANE UNDIVIDED ROAD**

3 DAYS or LESS

LAYOUT 43

NOTES:

1. For speeds 45 mph and greater, an Arrow Board shall be used. If an Arrow Board is not used, substitute a Type III Barricade with WO1-6 sign in the lane closure taper.
2. Traffic should not be stopped for intervals greater than 15 minutes.
- ③ Traffic control shall be identical for both directions. See Layout 39 for required placement of advance warning signs.
4. END ROAD WORK sign should be placed 500 feet past work area.



**TEMPORARY ROAD CLOSURE
MULTI-LANE UNDIVIDED ROAD**

12 HOURS or LESS

LAYOUT 44

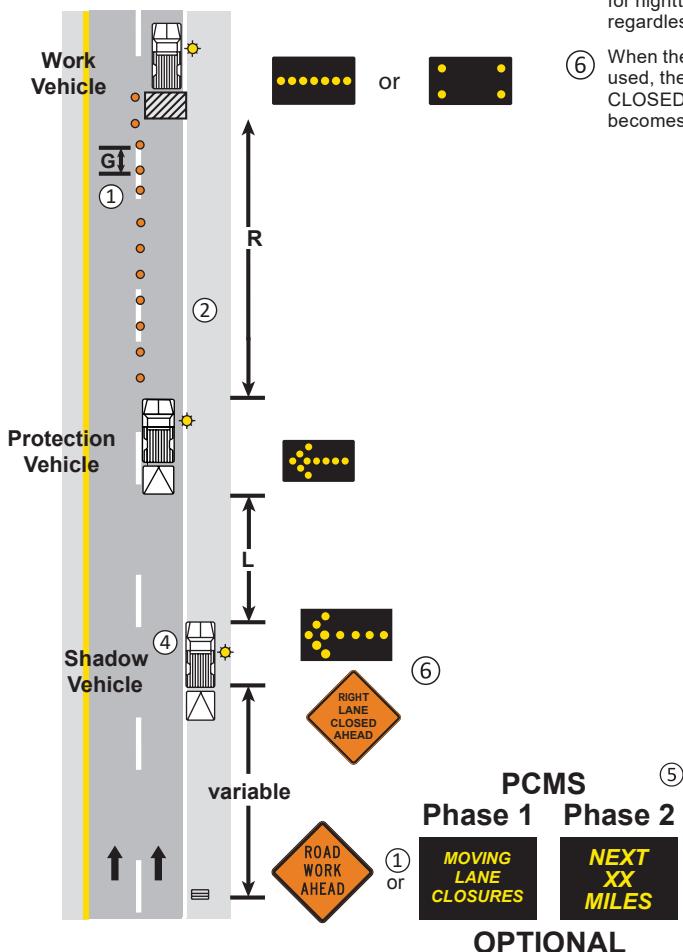
MULTI-LANE DIVIDED ROADS				
	MOBILE 15 Minutes or Less	SHORT DURATION 1 Hour or LESS	SHORT TERM 12 Hours or Less	INTERMEDIATE TERM 3 Days or Less
Work Vehicle Parked on Shoulder		4		71
Work on Shoulder		7		71
Work off Shoulder			6	
Work off Roadway	8			
Shoulder or Parking Lane Closure			6, 71	
Partial Shoulder Closure for Trailer Mounted Devices			5	
Lane Closures				
Mobile/Short Duration		45, 46, 47		
Near Intersection	58		59, 60, 61, 70	
Center Lane			51	
Left/Right Lane			52, 53	
Turn Lane			29, 30, 70	
Turn Lane on Dual Turn Lanes			70	
Double Lane	47			54, 55
Extended Lane			56	
Lane Shift			57	
Near Ramp			62, 63, 64, 65	
Partial Ramp Closure			66	
Ramp Closure	48, 49, 50			67, 68
Closure at Top of Entrance Ramp			69	
Re-Surfacing Operation			61	
Temporary Road Closure			28	
Sidewalk Closure			85, 86	
Crossroad and Confirmation Signing			31	

* NOTE: Posted Speed Limit 35 mph or less only.

NOTES:

- ① Channelizing devices and Advance Warning Sign (PCMS or ROAD WORK AHEAD) may be omitted if the operation moves at least the Decision Sight Distance (D) every 15 minutes or less (mobile operation).
- ② May use additional Protection Vehicle (not shown on layout) to close shoulder in advance of Work Vehicle.
3. Any Shadow Vehicle and Protection Vehicle operating totally or partially in a traffic lane shall be equipped with a TMA.
- ④ Shadow Vehicle 1 may encroach into the traffic lane when the shoulder is too narrow to drive on.

- ⑤ The PCMS shall be used for nighttime operations regardless of duration.
- ⑥ When the PCMS is used, the RIGHT LANE CLOSED AHEAD sign becomes optional.



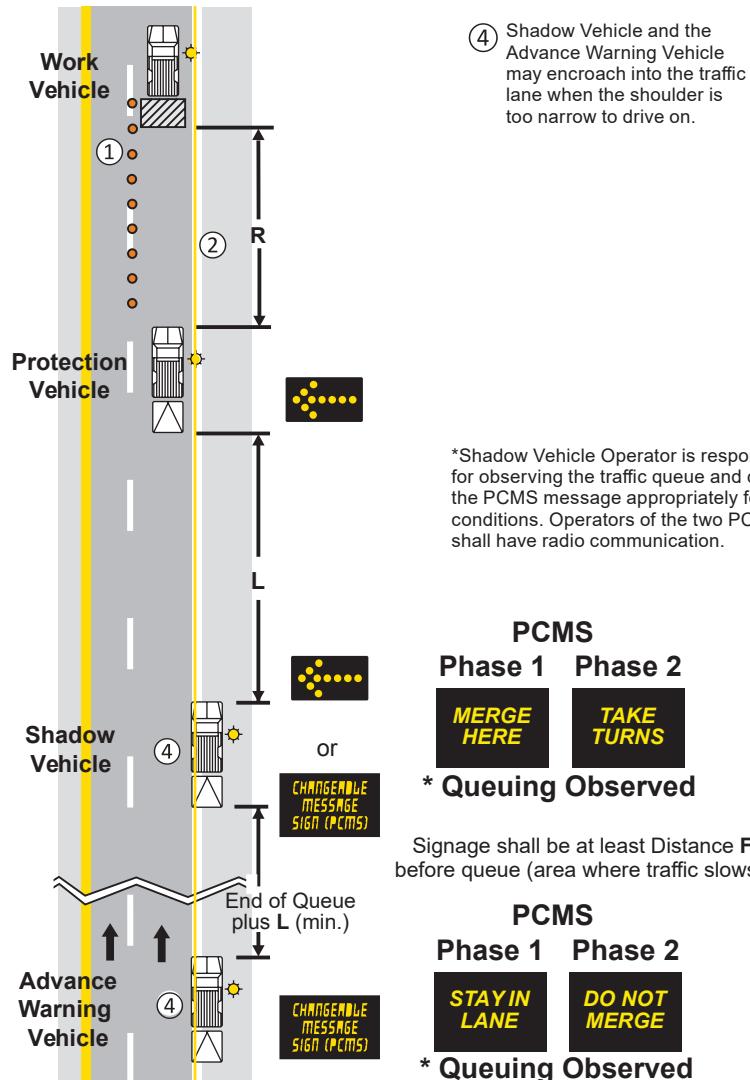
**MOBILE/SHORT DURATION LANE CLOSURE
MULTI-LANE DIVIDED ROAD**

1 HOUR or LESS

LAYOUT 45

NOTES:

- ① Channelizing devices may be omitted if the operation moves at least the Decision Sight Distance (D) every 15 minutes or less (mobile operation).
- ② May use additional Protection Vehicle (not shown on layout) to close shoulder in advance of Work Vehicle.
3. Any Shadow Vehicle, Protection Vehicle, and Advance Warning Vehicle operating totally or partially in a traffic lane shall be equipped with a TMA.



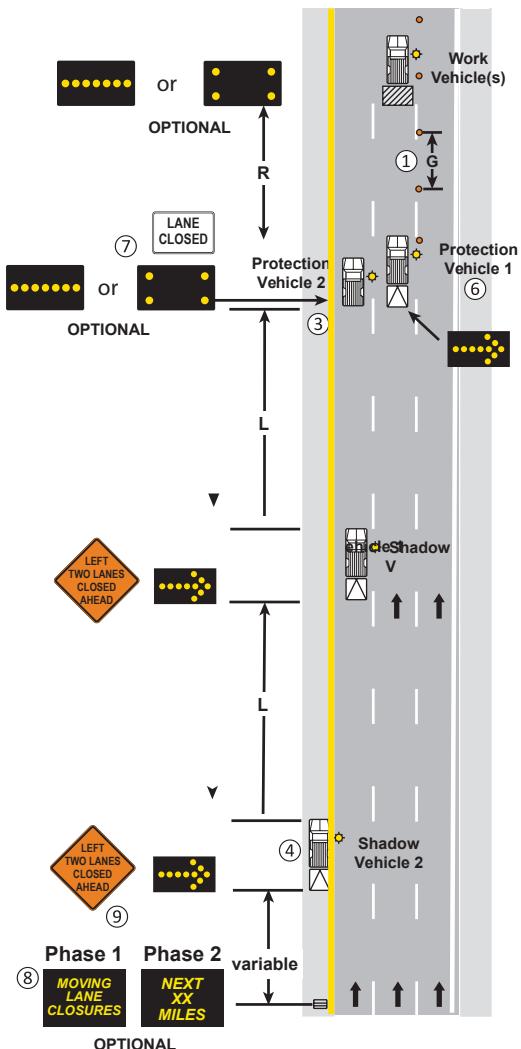
**MOBILE/SHORT DURATION LANE CLOSURE
ACTIVE ZIPPER MERGE
MULTI-LANE ROAD**

1 HOUR or LESS

LAYOUT 46

NOTES:

- ① Channelizing devices may be omitted if the operation moves at least the Decision Sight Distance (D) every 15 minutes (mobile operation).
2. May reduce channelizer spacing as needed to prevent intrusions.
- ③ May use additional Protection Vehicle(s) (not shown on layout) to close shoulder and/or adjacent lane in advance of the Work Vehicle(s).



- ④ Shadow Vehicle may encroach into the traffic lane when the shoulder is too narrow to drive on. If so, a PCMS is required.
5. Any Shadow Vehicle operating totally or partially in a traffic lane shall be equipped with a TMA.
- ⑥ Protection Vehicle 1 shall be equipped with a TMA.
- ⑦ Flashing Arrow Board and/or TMA are optional on Protection Vehicle 2.
- ⑧ The PCMS shall be used for nighttime operations.
- ⑨ When the PCMS is used, the LEFT TWO LANES CLOSED AHEAD sign becomes optional.
10. Maximum spacing between Protection Vehicle 1 and closest Work Vehicle should not exceed 2R.
11. When channelizing devices are not used, the maximum distance between work vehicles is R.
12. If closing the right 2 lanes, ramp closures should be considered.

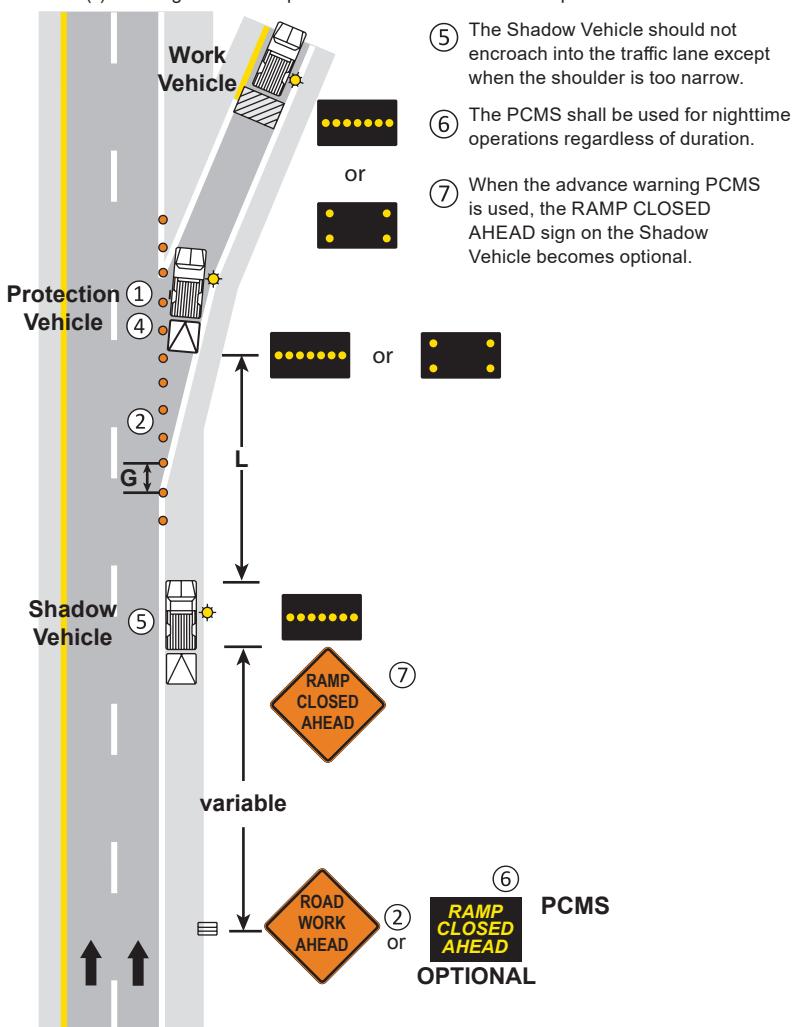
MOBILE/SHORT DURATION MULTI-LANE CLOSURE MULTI-LANE DIVIDED ROAD

1 HOUR or LESS

LAYOUT 47

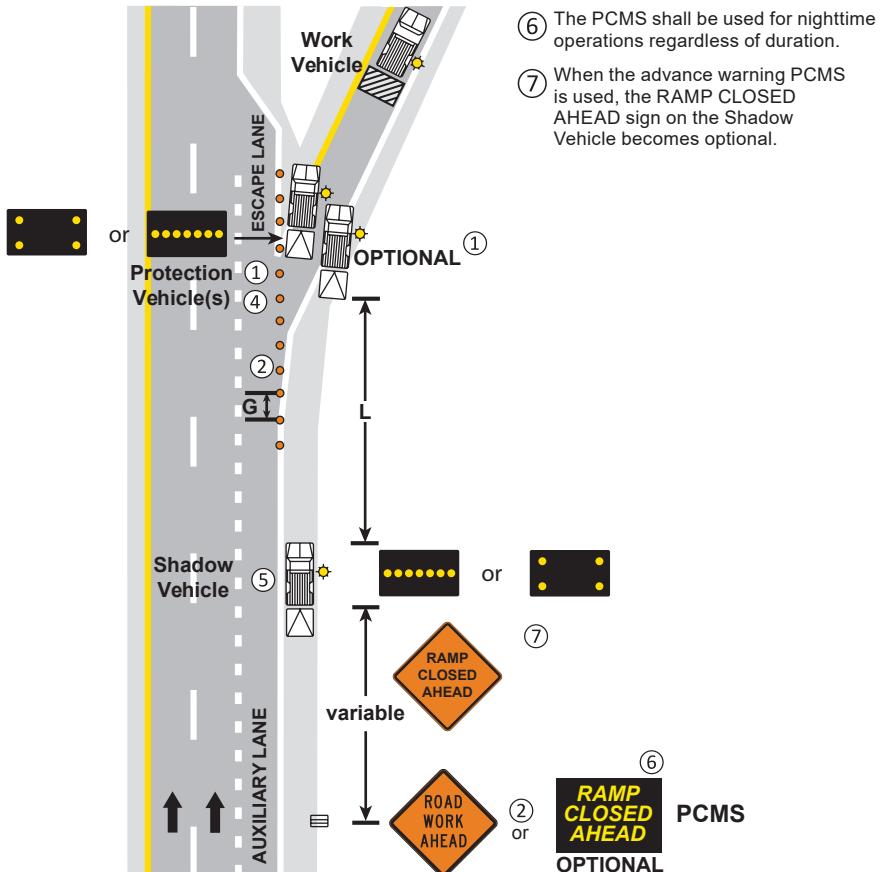
NOTES:

- ① The Protection Vehicle should remain positioned near the ramp gore to prevent traffic from using the exit ramp. An optional second Protection Vehicle may be needed to block wider exit ramps. If a Protection Vehicle follows the Work Vehicle up the ramp, then it shall remain a minimum distance R from the work area.
- ② Channelizing devices and Advance Warning Sign (PCMS or ROAD WORK AHEAD) may be omitted if the ramp will be opened within 15 minutes.
3. Any Shadow Vehicle and Protection Vehicle operating totally or partially in a traffic lane shall be equipped with a TMA.
- ④ The vehicle(s) blocking the exit ramp shall not encroach into lanes open to traffic.



NOTES:

- ① The Protection Vehicle should remain positioned near the ramp gore to prevent traffic from using the exit ramp. An optional second Protection Vehicle may be needed to block wider exit ramps. If a Protection Vehicle follows the Work Vehicle up the ramp, then it shall remain a minimum distance R from the work area.
- ② Channelizing devices and Advance Warning Sign (PCMS or ROAD WORK AHEAD) may be omitted if the ramp will be opened within 15 minutes.
3. Any Shadow Vehicle and Protection Vehicle operating totally or partially in a traffic lane shall be equipped with a TMA.
- ④ The vehicle(s) blocking the exit ramp shall not encroach into lanes open to traffic.
- ⑤ The Shadow Vehicle should not encroach into the traffic lane except when the shoulder is too narrow.



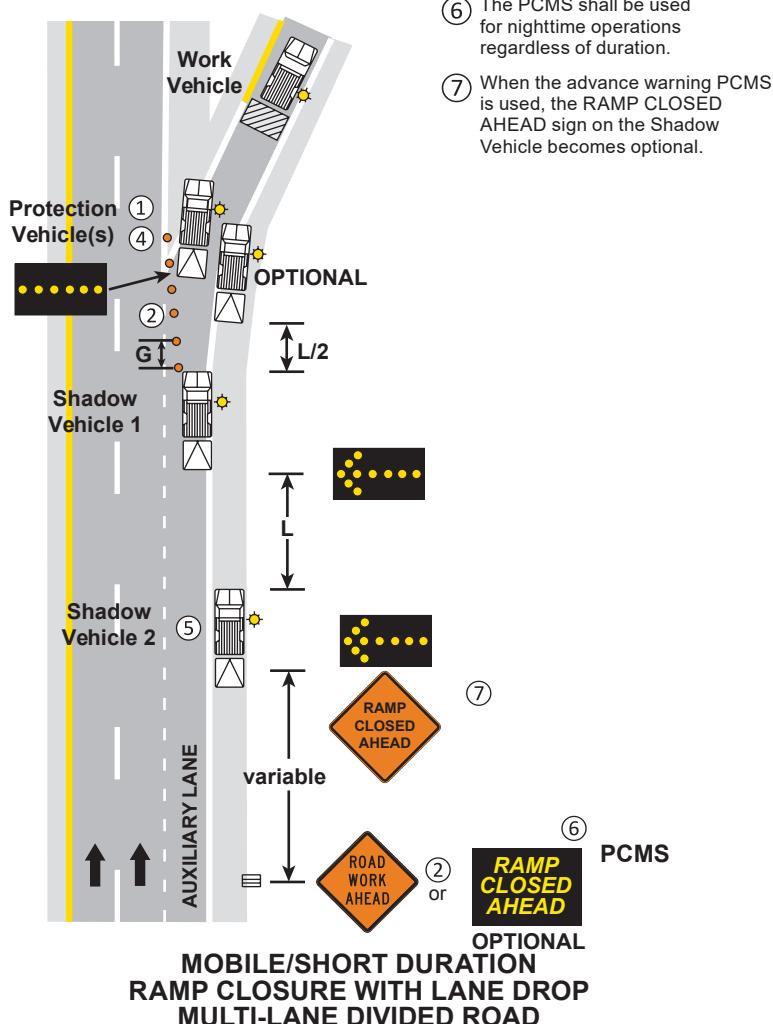
**MOBILE/SHORT DURATION
RAMP CLOSURE WITH ESCAPE LANE
MULTI-LANE DIVIDED ROAD**

1 HOUR or LESS

LAYOUT 49

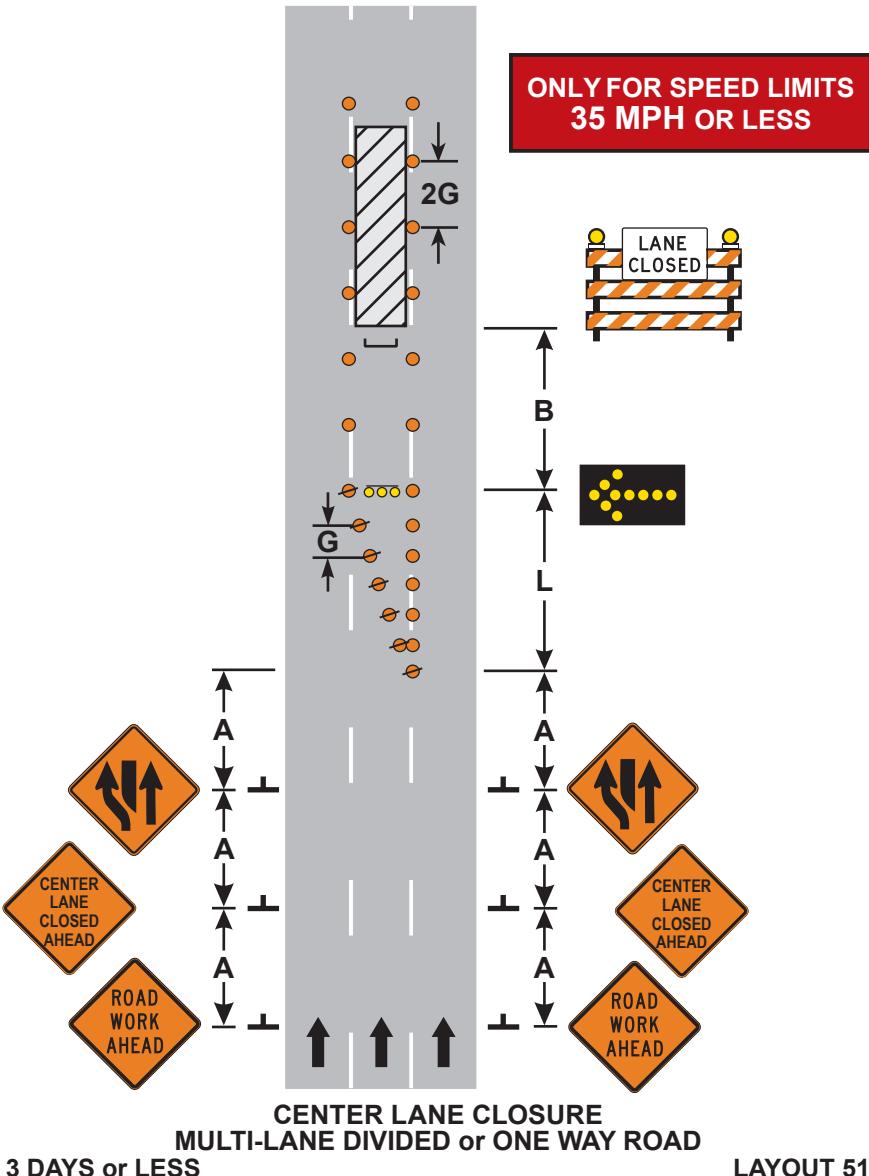
NOTES:

- ① The Protection Vehicle should remain positioned near the ramp gore to prevent traffic from using the exit ramp. An optional second Protection Vehicle may be needed to block wider exit ramps. If a Protection Vehicle follows the Work Vehicle up the ramp, then it shall remain a minimum distance R from the work area.
- ② Channelizing devices and Advance Warning Sign (PCMS or ROAD WORK AHEAD) may be omitted if the ramp will be opened within 15 minutes.
3. Any Shadow Vehicles and Protection Vehicles operating totally or partially in a traffic lane shall be equipped with a TMA.
- ④ The vehicle(s) blocking the exit ramp shall not encroach into lanes open to traffic.
- ⑤ Shadow Vehicle 2 should not encroach into the traffic lane except when the shoulder is too narrow.



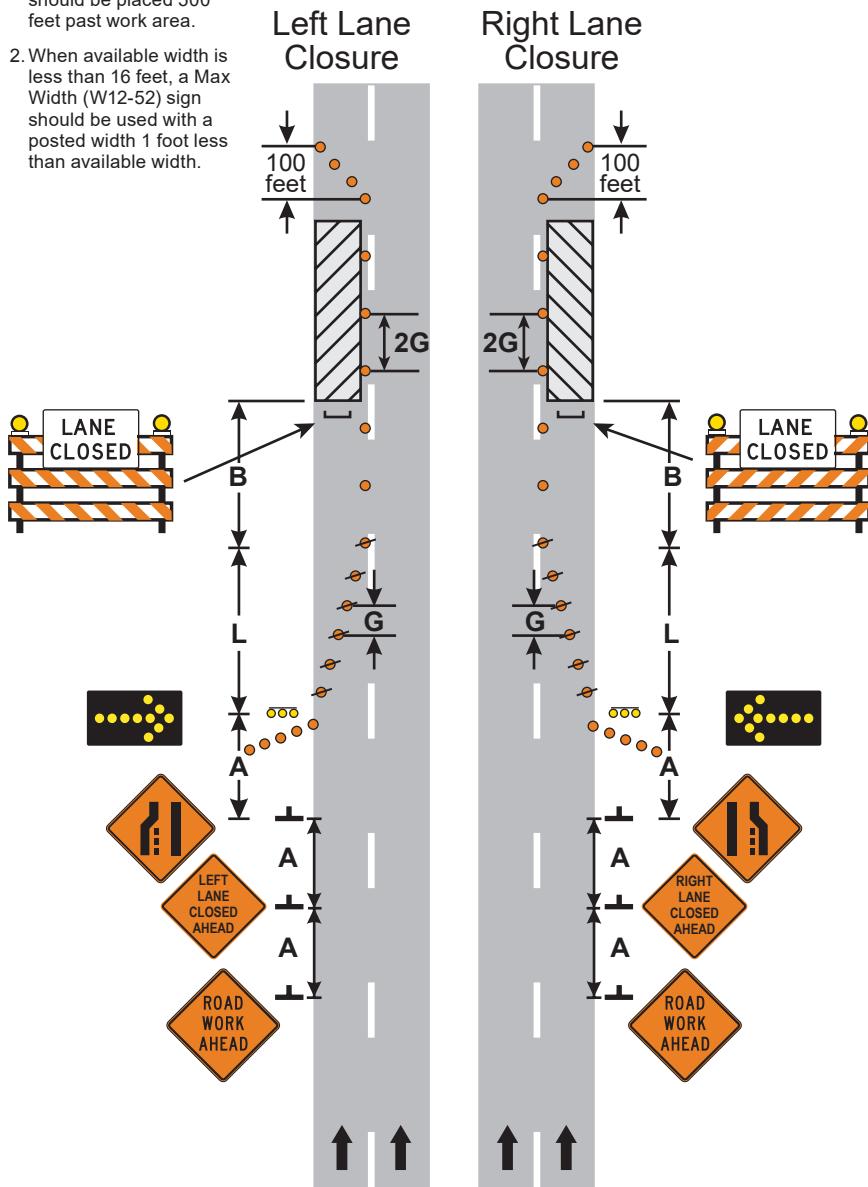
NOTES:

1. If traffic volumes are low, a double lane closure is preferred.
2. Consider a double lane closure when workers are present.
3. END ROAD WORK sign should be placed 500 feet past work area.
4. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.
5. If frequently accessing and egressing from the work area, a double lane closure is preferred.



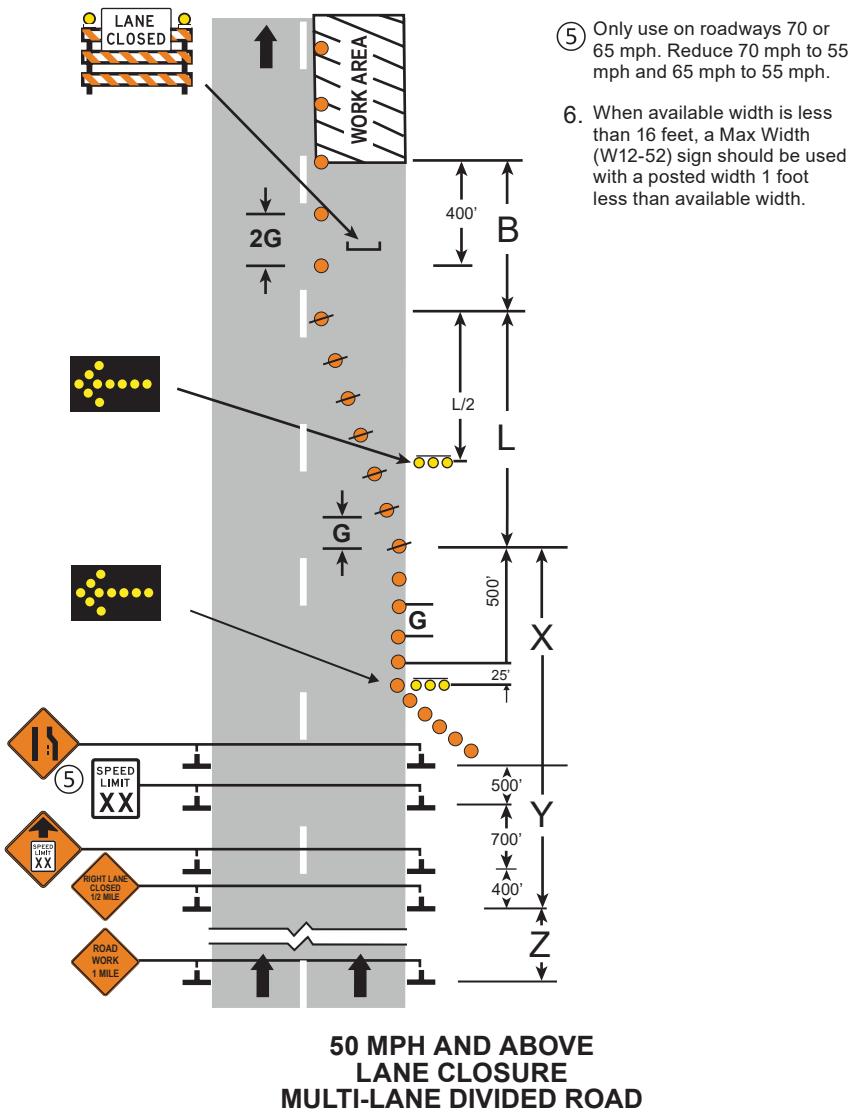
NOTES

1. END ROAD WORK sign should be placed 500 feet past work area.
2. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.



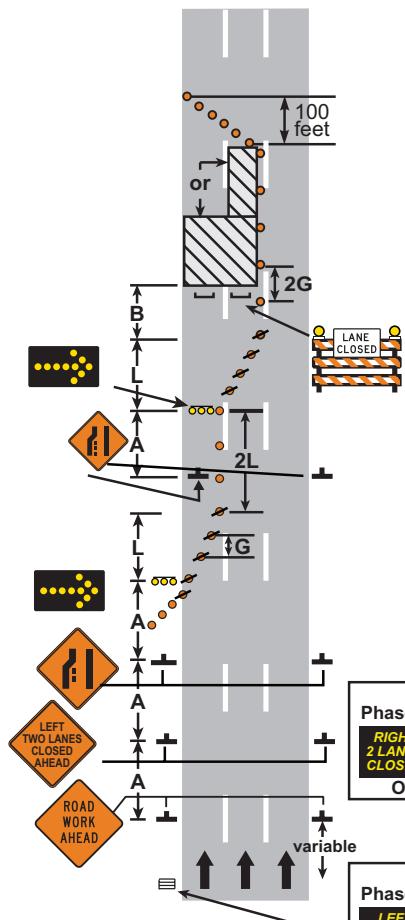
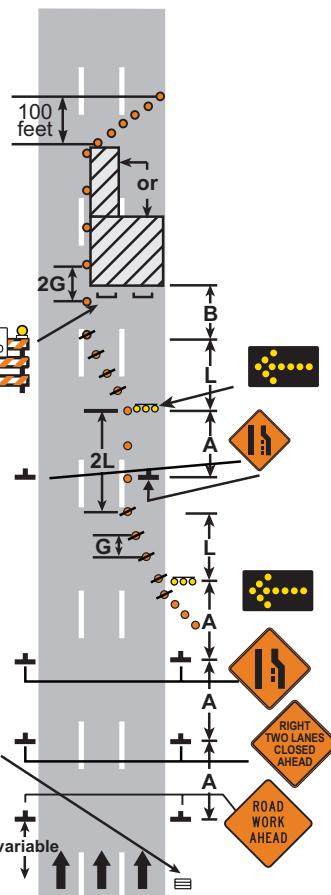
NOTES

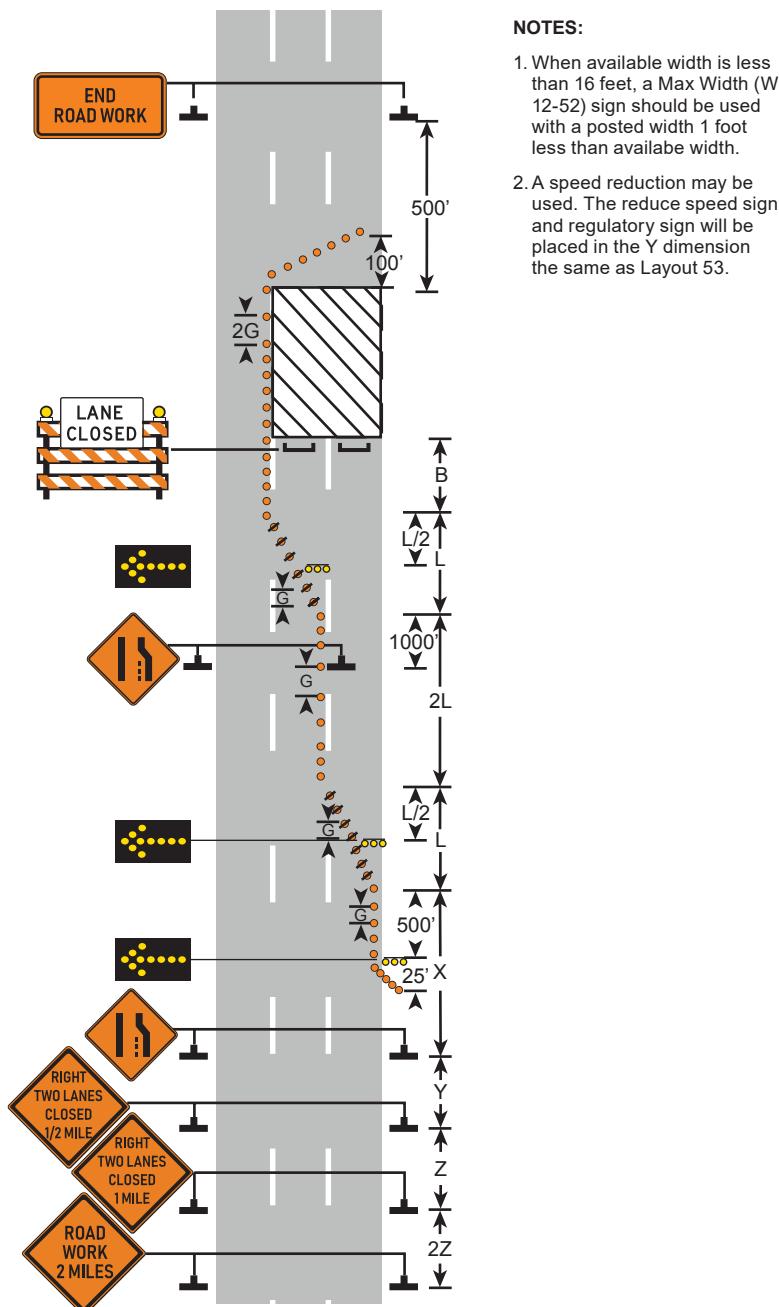
1. This lane closure is typical for closing a right lane, reverse for closing left lane.
2. All in place speed limit signs shall be covered when work zone speed limit is implemented.
3. Work zone speed limit assemblies shall be removed, covered, or modified to the existing posted speed limit when workers are not present.
4. A Speed Limit sign shall be located 1,500 feet beyond end of acceleration lane of each entrance ramp. Place a speed limit sign every 3 miles. Include a resume Speed Limit sign 200 feet minimum (500 feet desirable) beyond END OF ROAD WORK sign. Signs not shown in layout.



NOTES

1. Place PCMS in advance to allow drivers to direct or use alternate routes.
2. END ROAD WORK sign should be placed 500 feet past work area.
3. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.

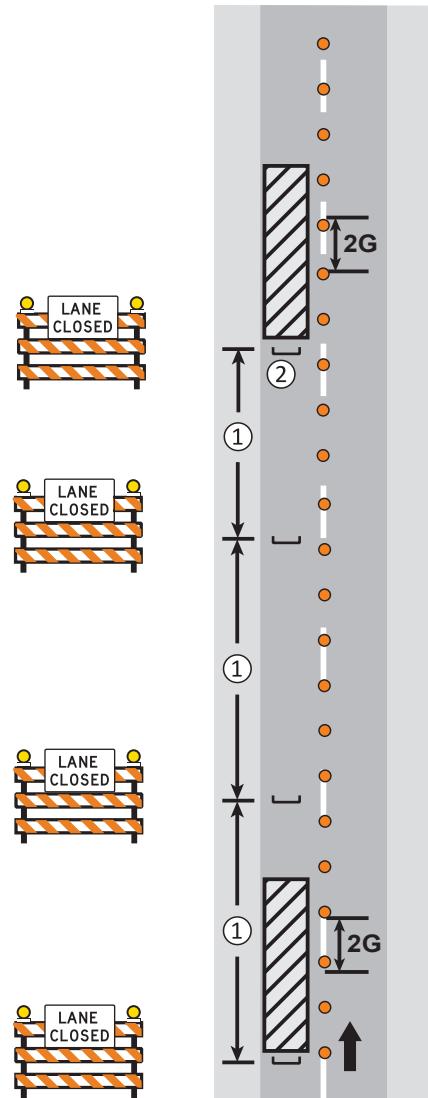
Left lane closed**Right lane closed**

**NOTES:**

- When available width is less than 16 feet, a Max Width (W 12-52) sign should be used with a posted width 1 foot less than available width.
- A speed reduction may be used. The reduce speed sign and regulatory sign will be placed in the Y dimension the same as Layout 53.

NOTES:

- ① Install a Type III barricade at the beginning of each work space and at 1/4 mile intervals within the closed lane.
- ② The Type III barricade within the work space may be temporarily removed when it interferes with active work operations. The barricade must be replaced when active work operations end.
3. Type A Warning Lights (Flashing) shall be used on barricades if installed overnight.



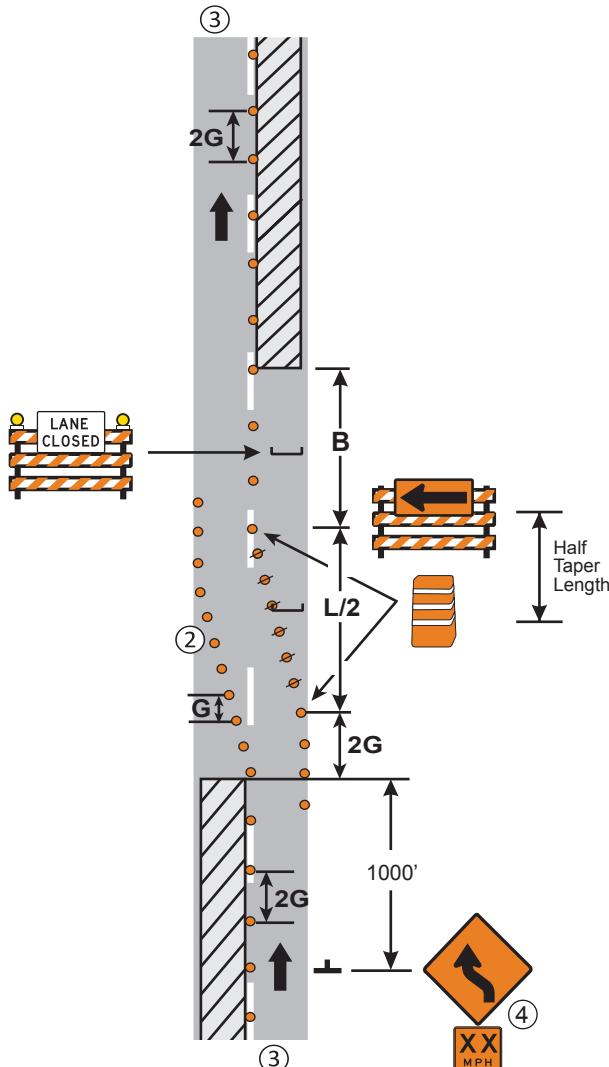
**LANE CLOSURE EXTENSION
MULTI-LANE DIVIDED or ONE WAY ROAD**

3 DAYS or LESS

LAYOUT 56

NOTES:

1. For one lane of traffic only.
- ② Continue the pattern and the spacing of devices for additional lateral shift if shifting from right lane to left lane on more than a 2-lane roadway.
- ③ For advance signing, placement of traffic control devices, lane taper, see the appropriate stationary layout.
- ④ Use Advisory Speed Sign if design speed is 10 MPH below posted speed.

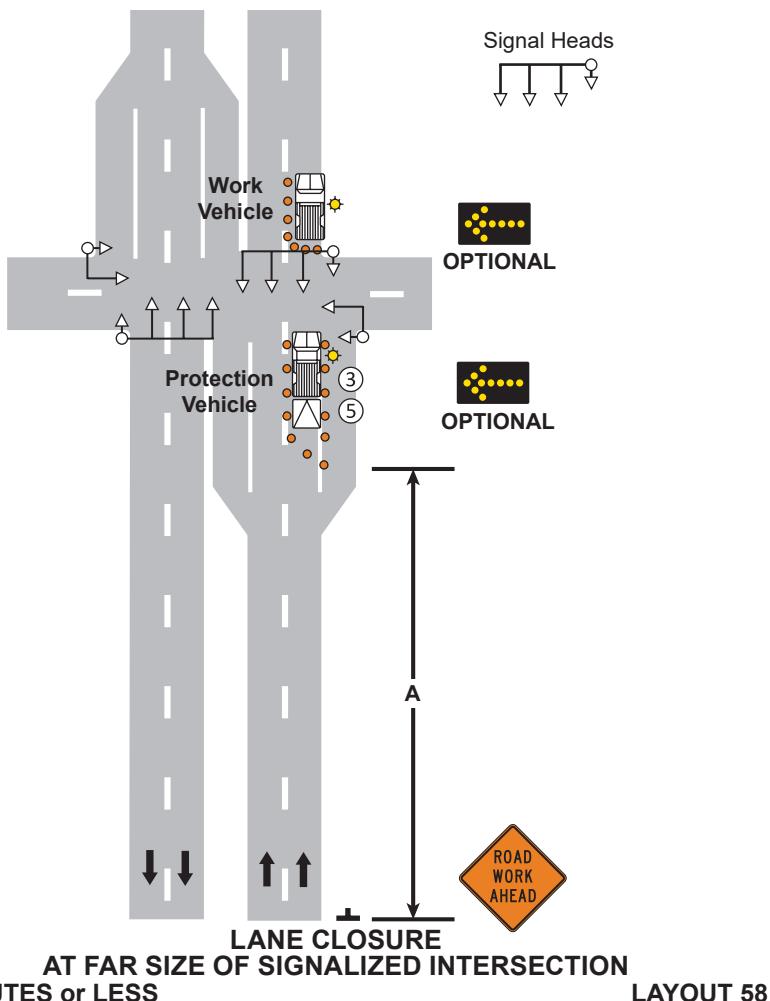


**LANE SHIFT
MULTI-LANE DIVIDED or ONE WAY ROAD
3 DAYS or LESS**

LAYOUT 57

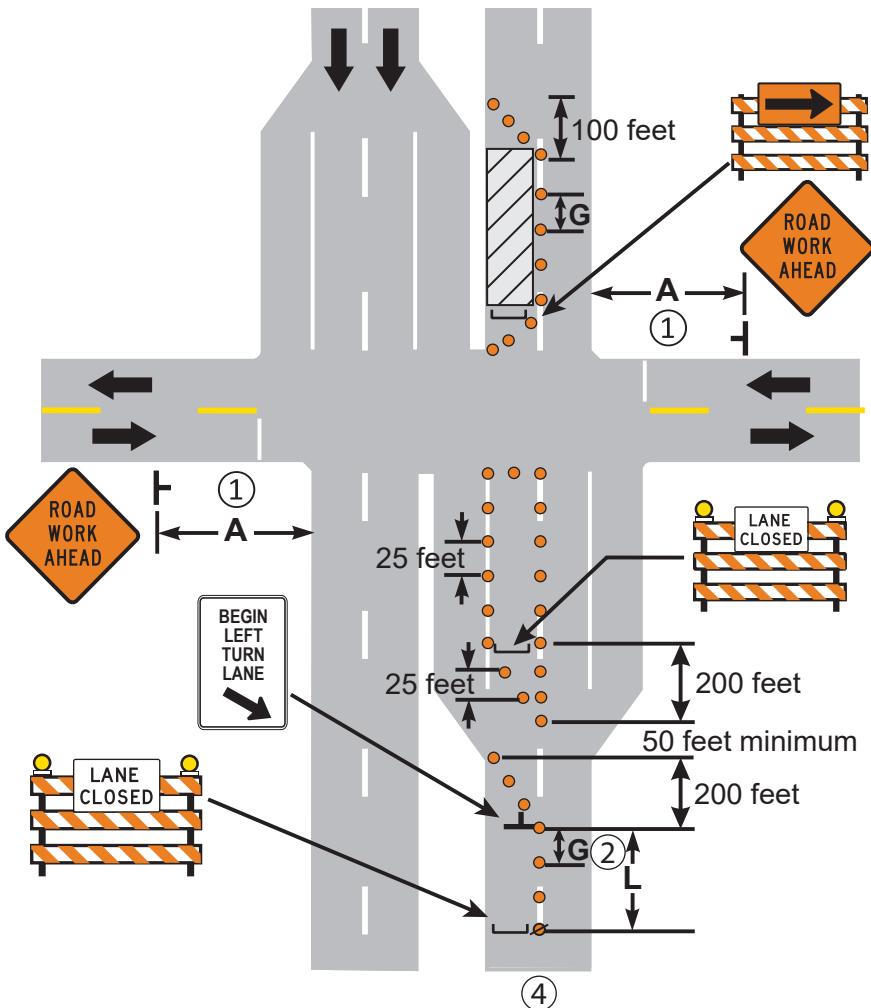
NOTES:

1. The operation shall not remain in one location for more than 15 minutes.
2. If the work space is not visible for at least the Decision Sight Distance (D), the appropriate stationary layout shall be used.
- ③ The traffic control signal should be put in an ALL-RED flash mode to facilitate traffic control at the work site. The Protection Vehicle may be omitted when signal is placed in ALL-RED flash mode. Channelizing devices may be omitted if a Protection Vehicle with a Flashing Arrow Board and TMA is used.
4. There should be little or no encroachment into the cross-street traffic path.
- ⑤ If signals are not placed in ALL-RED flash, the Protection Vehicle shall be equipped with a TMA and a Flashing Arrow Board.
6. The Work Vehicle shall be equipped with operating vehicle warning lights visible for 360 degrees.
7. The work vehicle and worker shall not be fully or partially suspended over the live lane of traffic.



NOTES

- ① Use the appropriate advance warning sign spacing for the speed on the cross road.
- ② Space channelizing devices closer (typically 25 feet apart) 100 feet before turn lane starts.
3. END ROAD WORK sign should be placed 500 feet past work area.
- ④ For advanced signing, placement of traffic control devices, and lane closure, see the appropriate stationary layout.



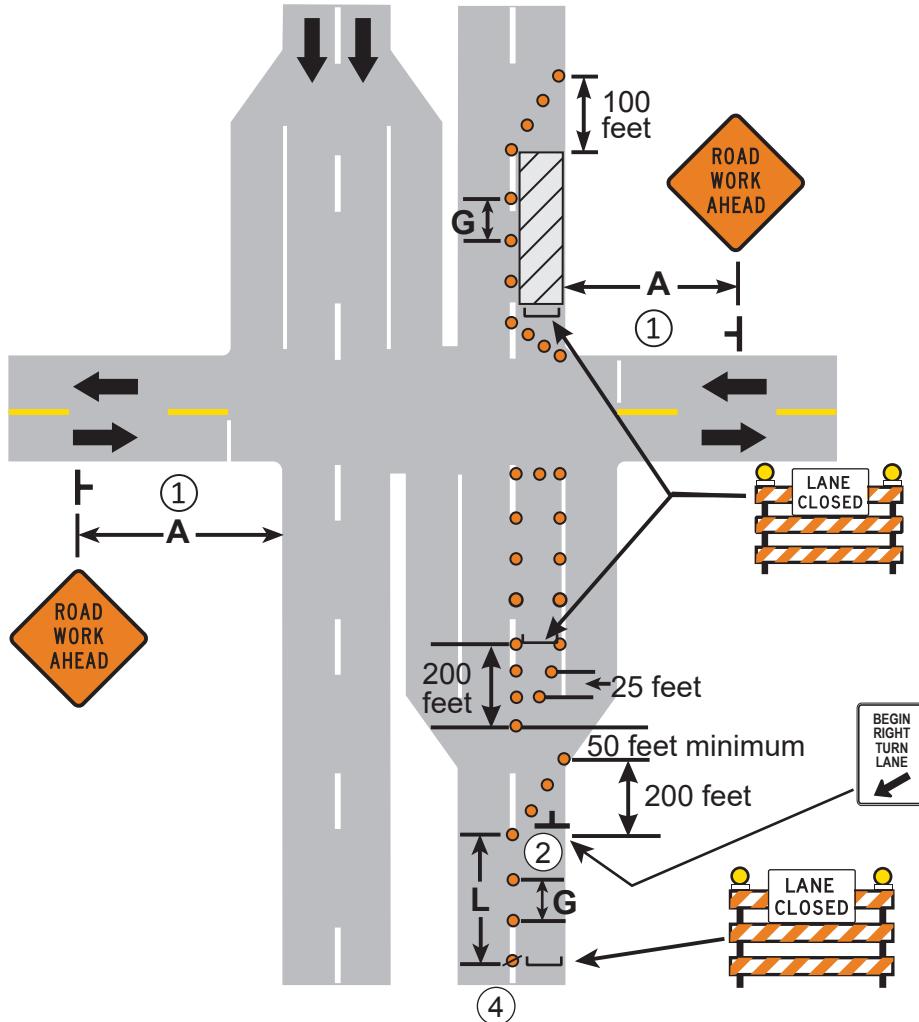
**LEFT LANE CLOSURE
WORK SPACE BEYOND INTERSECTION
MULTI-LANE DIVIDED ROAD**

3 DAYS or LESS

LAYOUT 59

NOTES:

- ① Use the appropriate advance warning sign spacing for the speed on the cross road.
- ② Space channelizing devices closer (typically 25' apart) 100' before turn lane starts.
3. END ROAD WORK sign should be placed 500 feet past work area.
- ④ For advance signing, placement of traffic control devices, and lane closure, see the appropriate stationary layout.



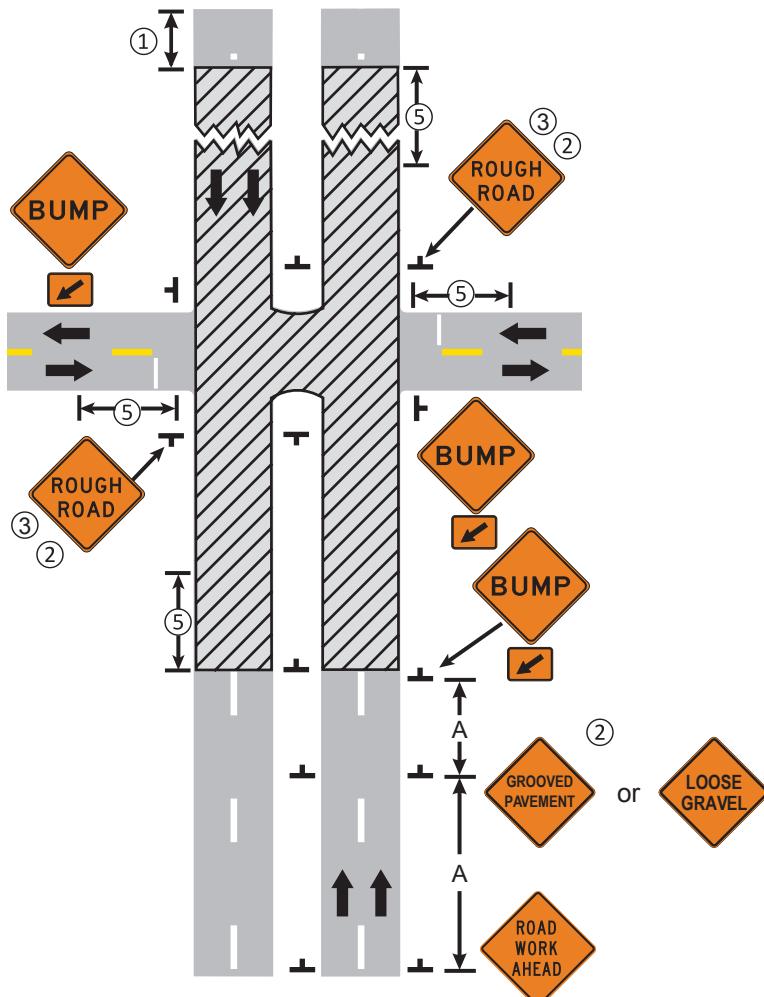
**RIGHT LANE CLOSURE
WORK SPACE BEYOND INTERSECTION
MULTI-LANE DIVIDED ROAD**

3 DAYS or LESS

LAYOUT 60

NOTES

- ① Use the same warning signs and spacings for the other approach to the milled roadway surface area.
- ② Use the appropriate warning sign for the roadway condition. (e.g., GROOVED PAVEMENT, LOOSE GRAVEL.)
- ③ Refer to Layout 31 for confirmation signing.
4. Consider delineating raised structures (manhole covers, etc.)
- ⑤ Refer to Layout 80 for bump signing.
6. END ROAD WORK sign should be placed 500 feet past work area.



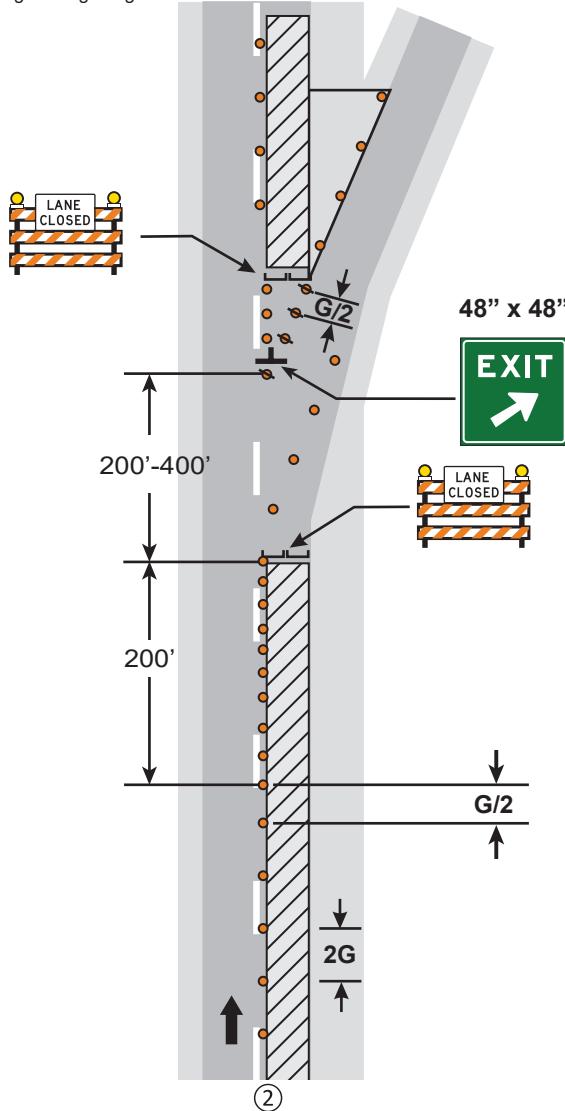
**RESURFACING OPERATION
WORK SPACE BEFORE AND THROUGH INTERSECTION
MULTI-LANE DIVIDED ROAD**

3 DAYS or LESS

LAYOUT 61

NOTES:

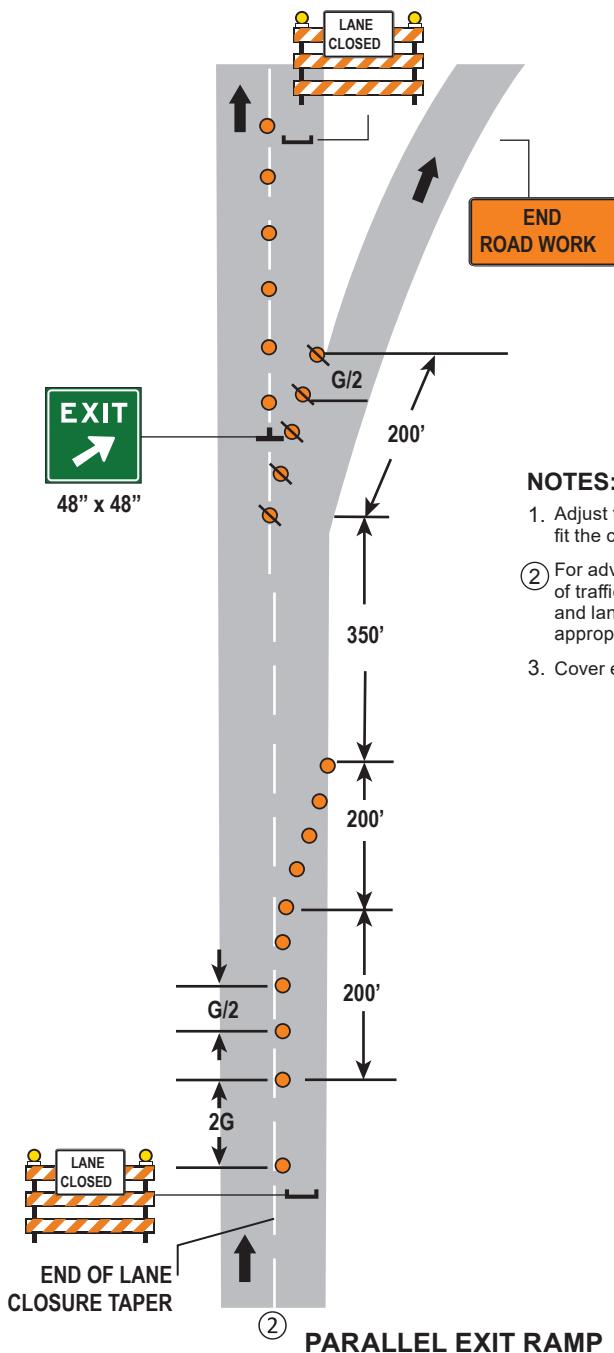
1. Adjust the ramp exit to fit the conditions.
- ② For advance signing, placement of traffic control devices, and lane closure, see the appropriate stationary layout.
3. Use this layout when working in close proximity to the exit ramp. Otherwise use layout 63.
4. Cover existing exit sign in gore.



**MAINLINE RIGHT LANE CLOSED
EXIT RAMP OPEN**

3 DAYS or LESS

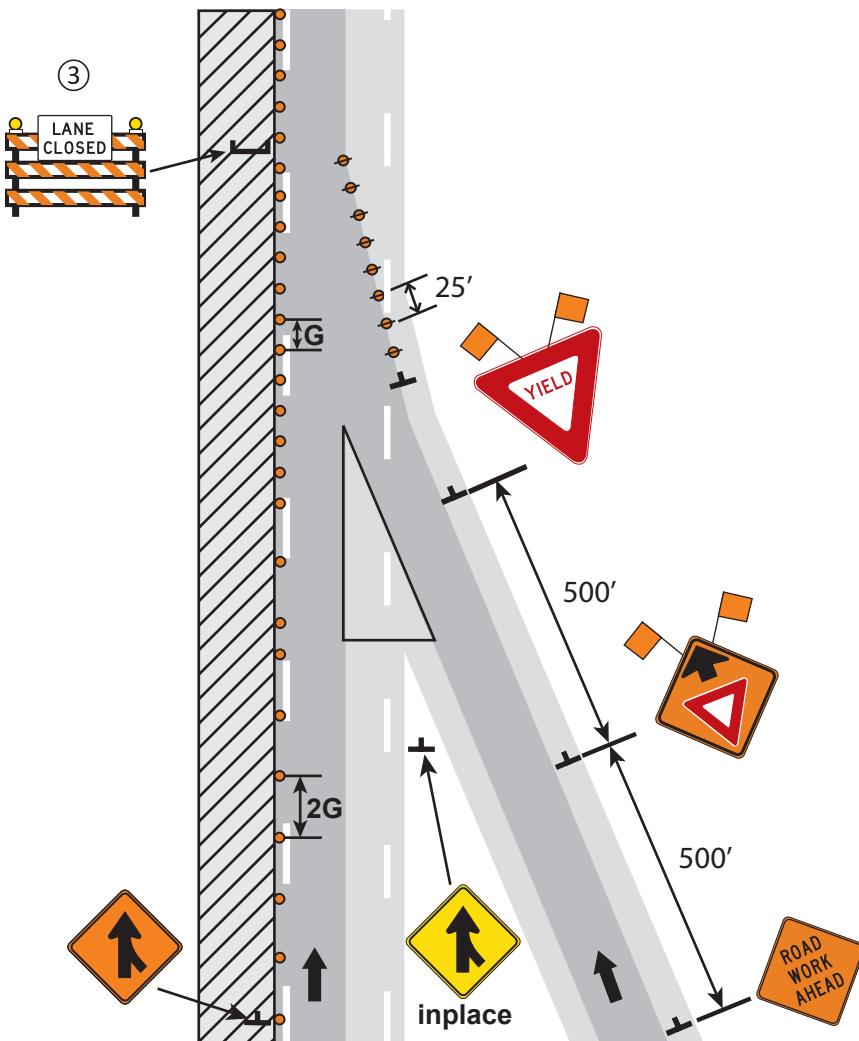
LAYOUT 62

**NOTES:**

1. Adjust the ramp exit to fit the conditions.
- (2) For advance signing, placement of traffic control devices, and lane closure, see the appropriate stationary layout.
3. Cover existing exit sign in gore.

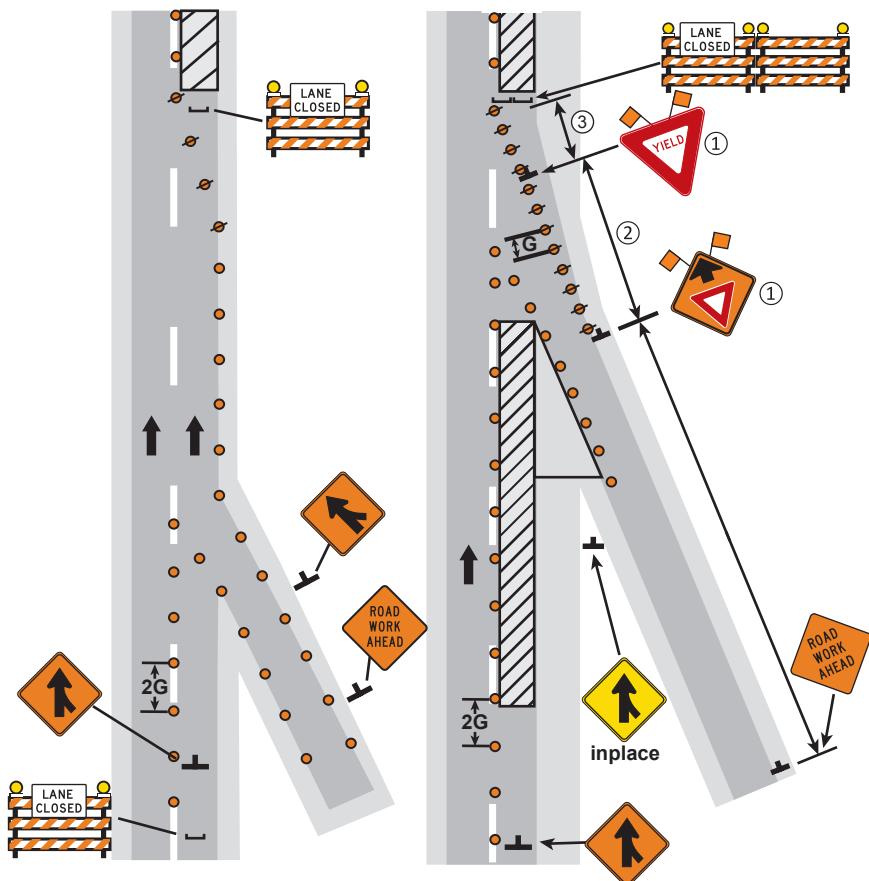
NOTES:

1. YIELD and Yield Ahead signs may be added when geometry and traffic conditions do not allow for normal merging behavior, (see Layout 65). Place Yield Sign to provide adequate sight and acceleration distance.
2. The advance warning sign spacing is dependent on the ramp length and the location of in-place signing. The spacing should be as long as is practical.
- ③ Place the Type III Barrier approximately opposite the end of the ramp taper.



NOTES:

- ① Adjust the ramp entrance to fit the conditions to allow a ramp acceleration lane if possible. YIELD and Yield Ahead signs may be omitted when geometry and traffic conditions allow for normal merging behavior.
- ② The advance warning sign spacing is dependent on the ramp length and the location of in-place signing. The spacing should be as long as is practical.
- ③ Provide adequate acceleration distance based on speed and ADT (typically 600 feet). Consult Regional Work Zone Engineer if reduced length is needed.



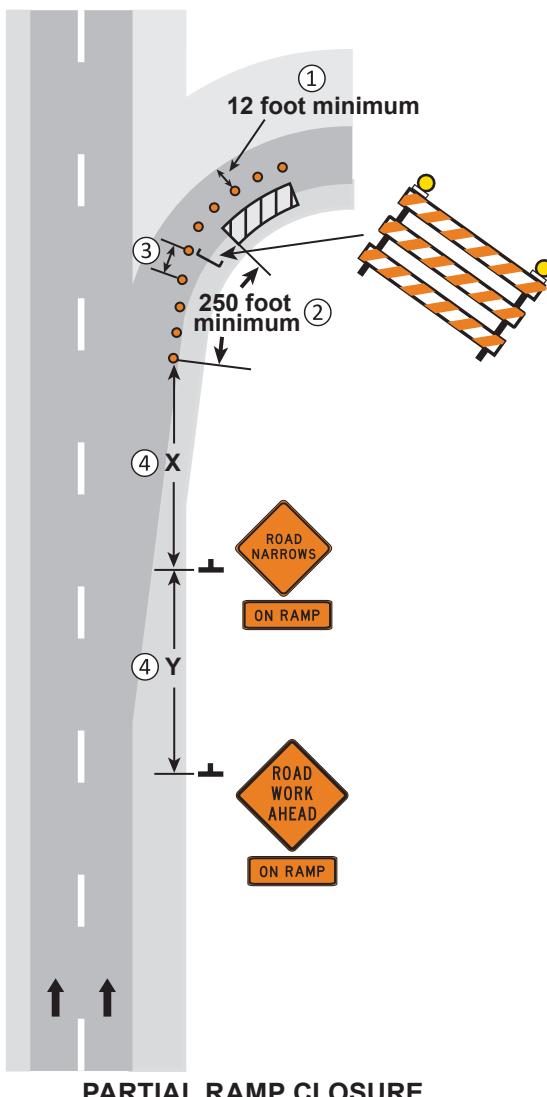
**MAINLINE RIGHT LANE CLOSED
ENTRANCE RAMP OPEN**

3 DAYS or LESS

LAYOUT 65

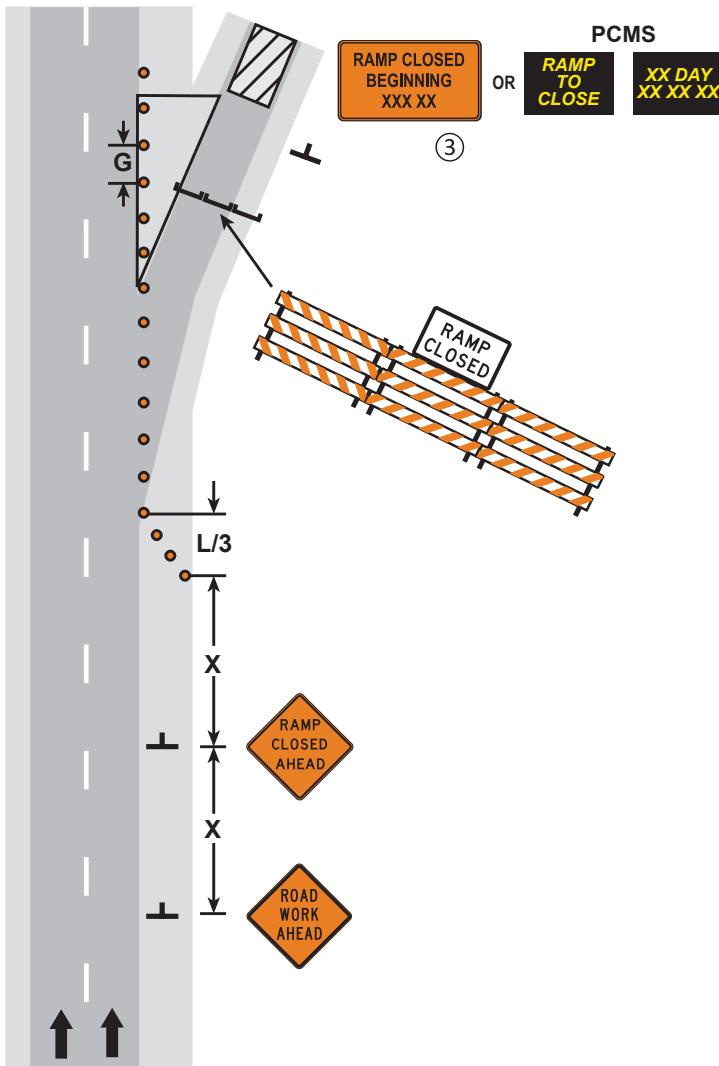
NOTES:

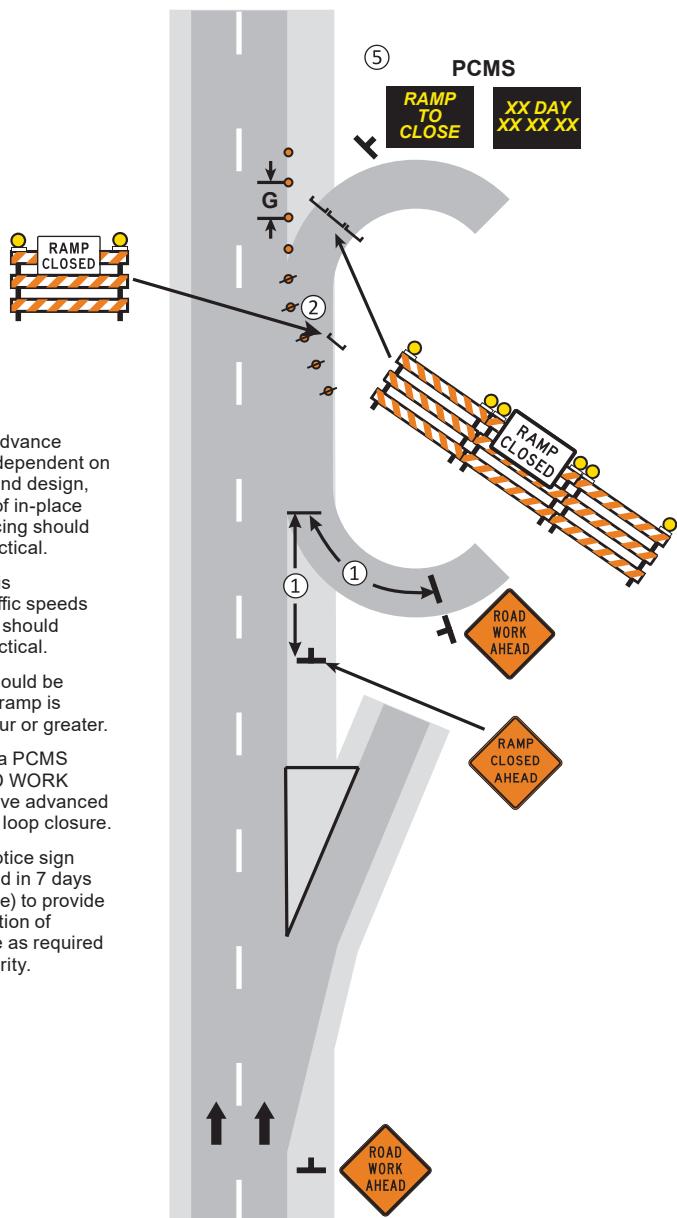
- ① Truck off-tracking should be considered when determining whether the 12-foot minimum lane width is adequate.
- ② Use a 250-foot minimum taper.
- ③ For loops, use 25-foot spacing between devices. For ramps, use 50-foot spacing between devices.
- ④ Adjust spacing of advance warning signs depending on the design of the interchange and the location of in-place signing.



NOTES:

1. Detour signing should be considered if the ramp is closed one hour or greater.
2. Consider adding a PCMS prior to the ROAD WORK AHEAD sign to give advanced notification of the ramp closure.
- ③ Ramp Closure Notice sign should be installed 7 days in advance (timewise) to provide adequate notification of upcoming closure as required by the road authority.



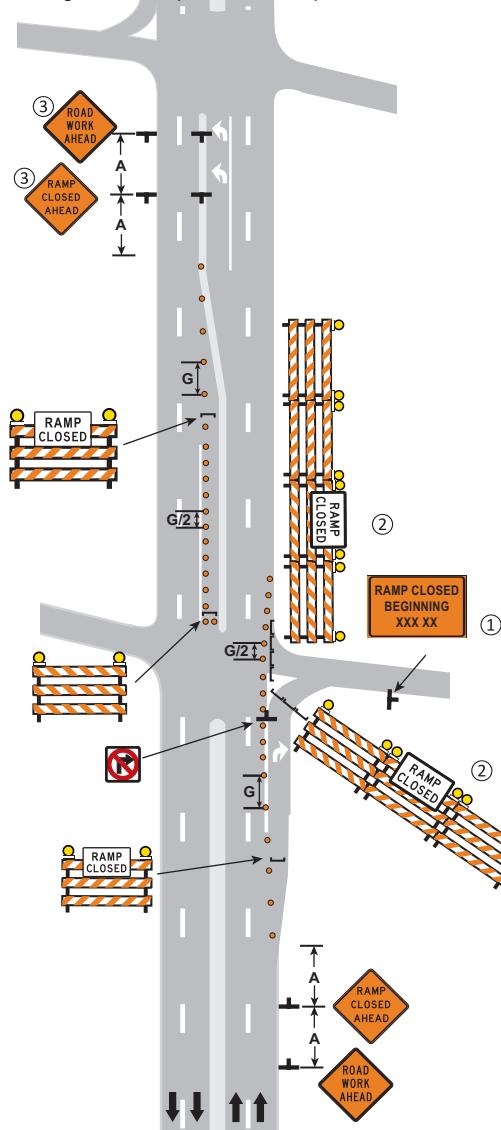
**NOTES:**

- ① The spacing for advance warning signs is dependent on the ramp length and design, and the location of in-place signing. The spacing should be as long as practical.
- ② The taper length is dependent on traffic speeds and volumes and should be as long as practical.
3. Detour signing should be considered if the ramp is closed for one hour or greater.
4. Consider adding a PCMS prior to the ROAD WORK AHEAD sign to give advanced notification of the loop closure.
- ⑤ Ramp Closure Notice sign should be installed in 7 days advance (timewise) to provide adequate notification of upcoming closure as required by the road authority.

EXIT LOOP CLOSURE**3 DAYS or LESS****LAYOUT 68**

NOTES:

- ① Ramp Closure Notice sign should be installed in 7 days advance (timewise) to provide adequate notification of upcoming closure as required by the road authority.
- ② Use ROAD CLOSED (R11-2) when road is closed.
- ③ Place on left shoulder/median when possible.
4. END ROAD WORK sign should be placed 500 feet past work area.



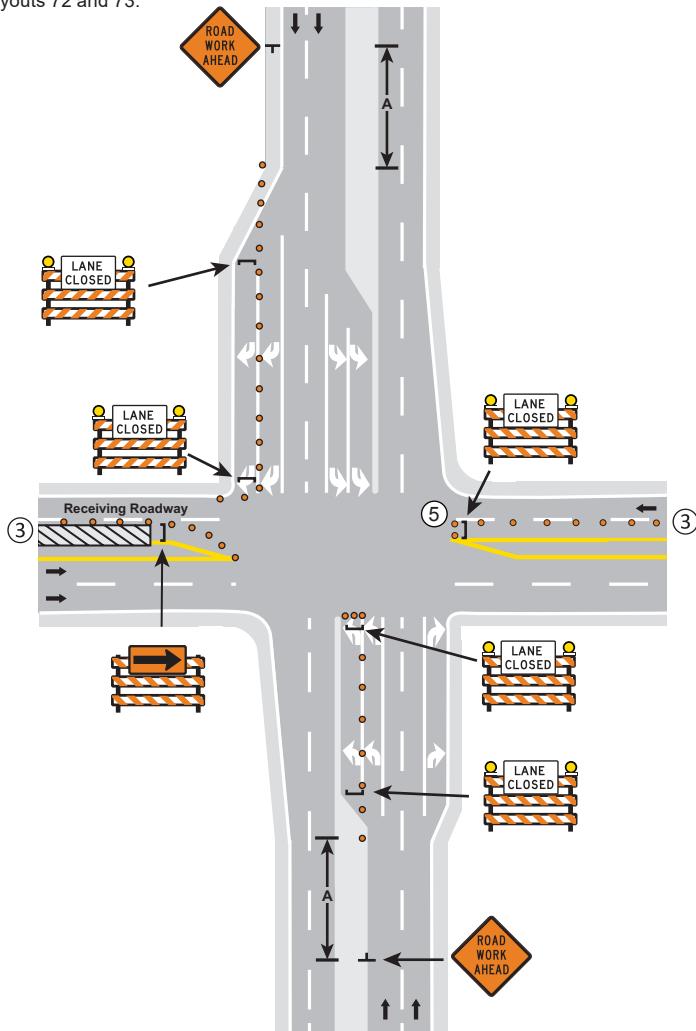
**CLOSURE AT TOP OF ENTRANCE RAMP
MULTI-LANE DIVIDED ROAD**

3 DAYS or LESS

LAYOUT 69

NOTES:

1. Contact the road authority for signal timing modifications before beginning work at or near any signalized intersection.
2. It is preferable to close the left-most dual left-turn lane and the right-most dual right-turn lane regardless of which lane is closed on the receiving roadway. Verify that turning movements can be completed.
- ③ For traffic control on receiving/intersecting roadway, see proper layout.
4. END ROAD WORK sign should be placed 500 feet past work area.
- ⑤ See Layouts 72 and 73.



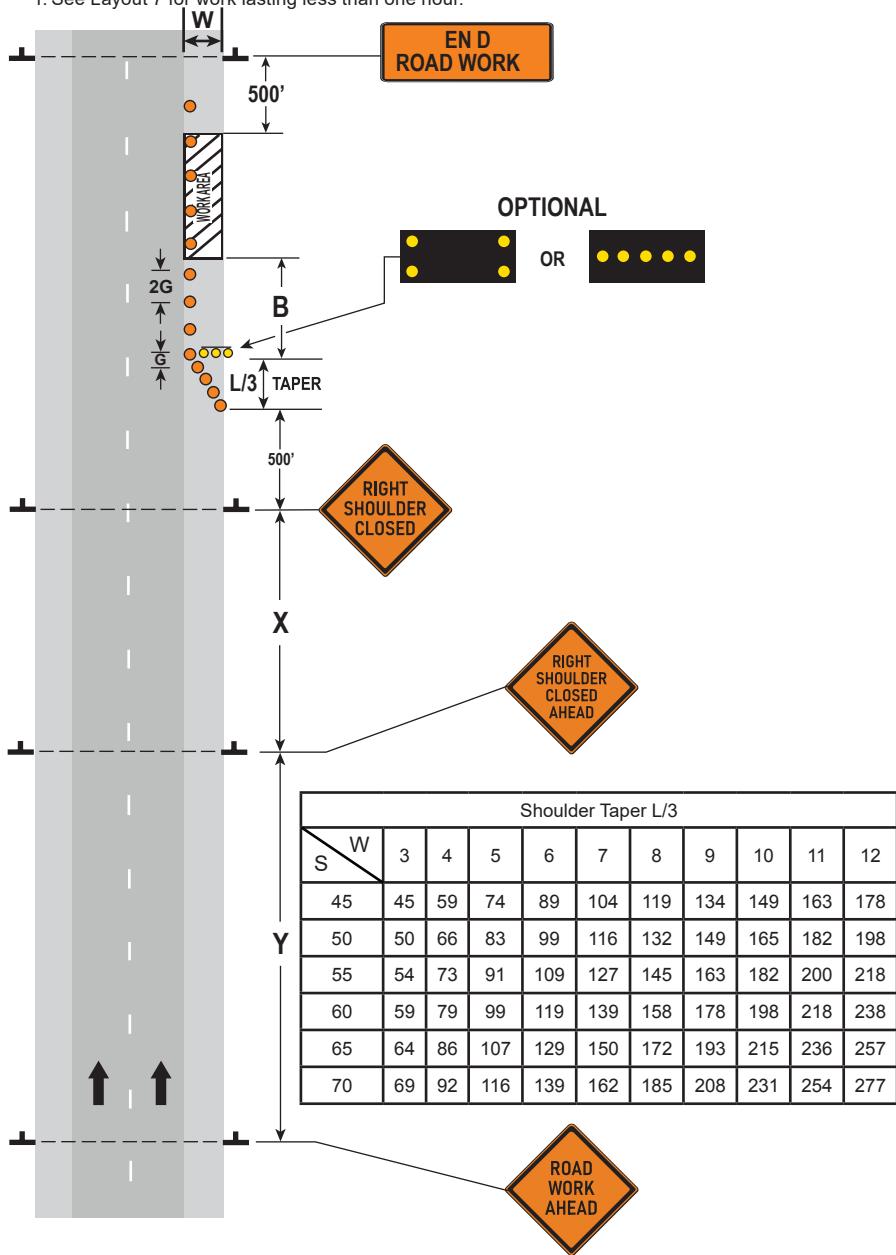
**CLOSING ONE TURN LANE ON DUAL TURN LANES
WORK ON INTERSECTING ROADWAY**

3 DAYS or LESS

LAYOUT 70

NOTES:

1. See Layout 7 for work lasting less than one hour.



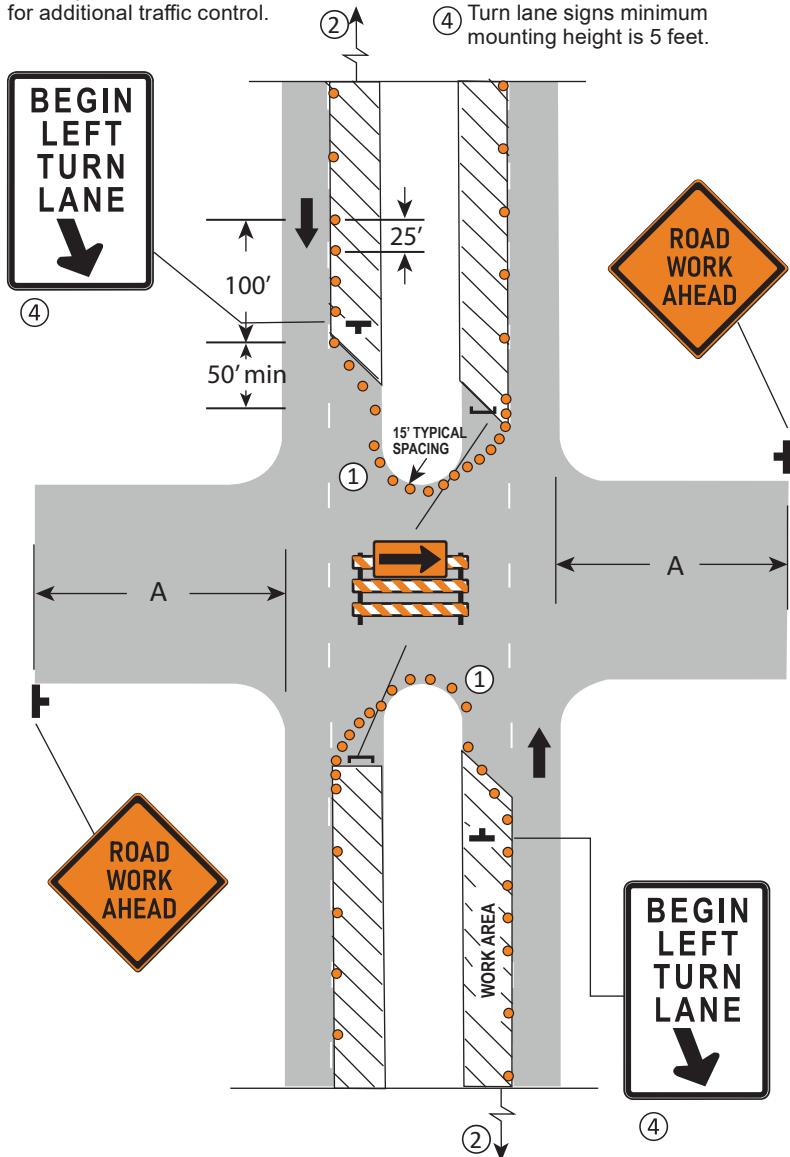
**SHOULDER CLOSURE ON DIVIDED ROADWAY
SPEEDS GREATER THAN 40 MPH**

3 DAYS or LESS

LAYOUT 71

NOTES

- ① Also use barricade and 15-foot typical drum spacing at commercial driveways.
- ② See separate lane closure detail for additional traffic control.
3. Provide turn lanes at intersections whenever staging of work allows. Taper and turn lane lengths based on field conditions.
- ④ Turn lane signs minimum mounting height is 5 feet.



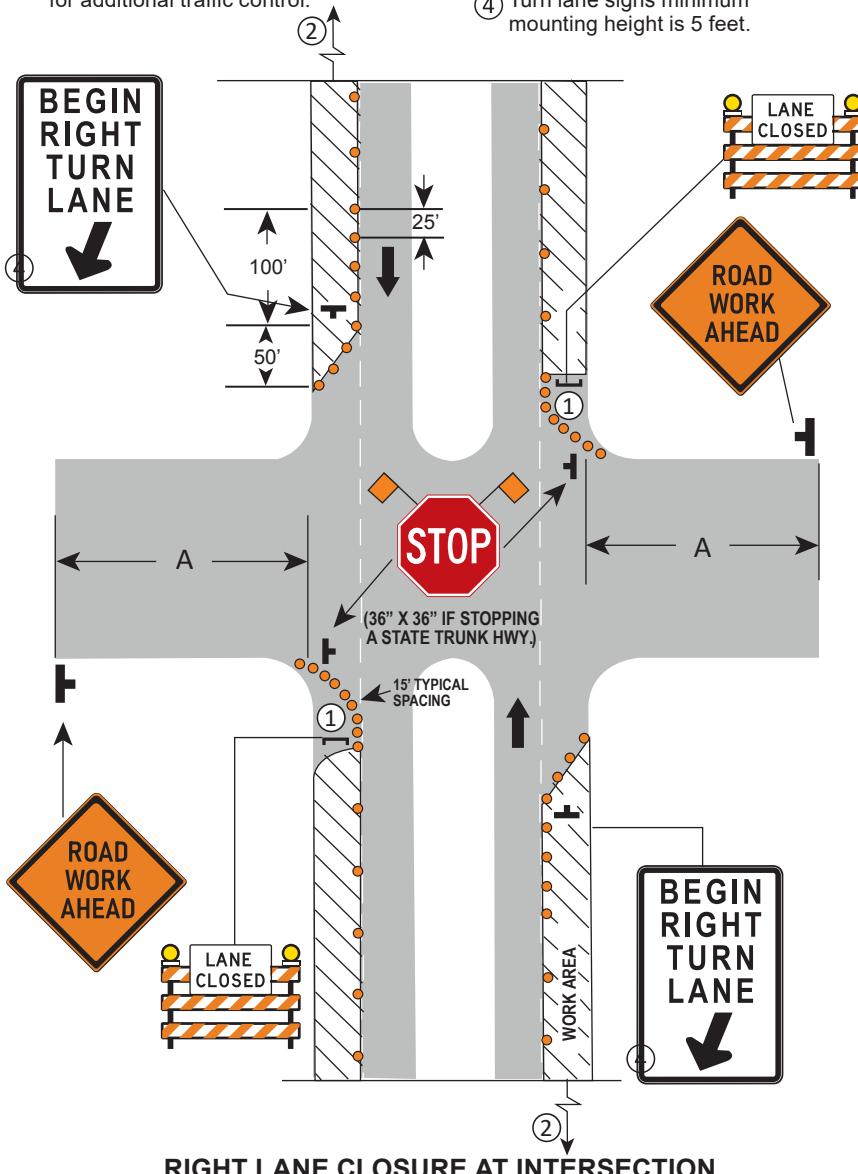
**LEFT LANE CLOSURE AT
INTERSECTION OR MEDIAN OPENING**

3 DAYS or LESS

LAYOUT 72

NOTES:

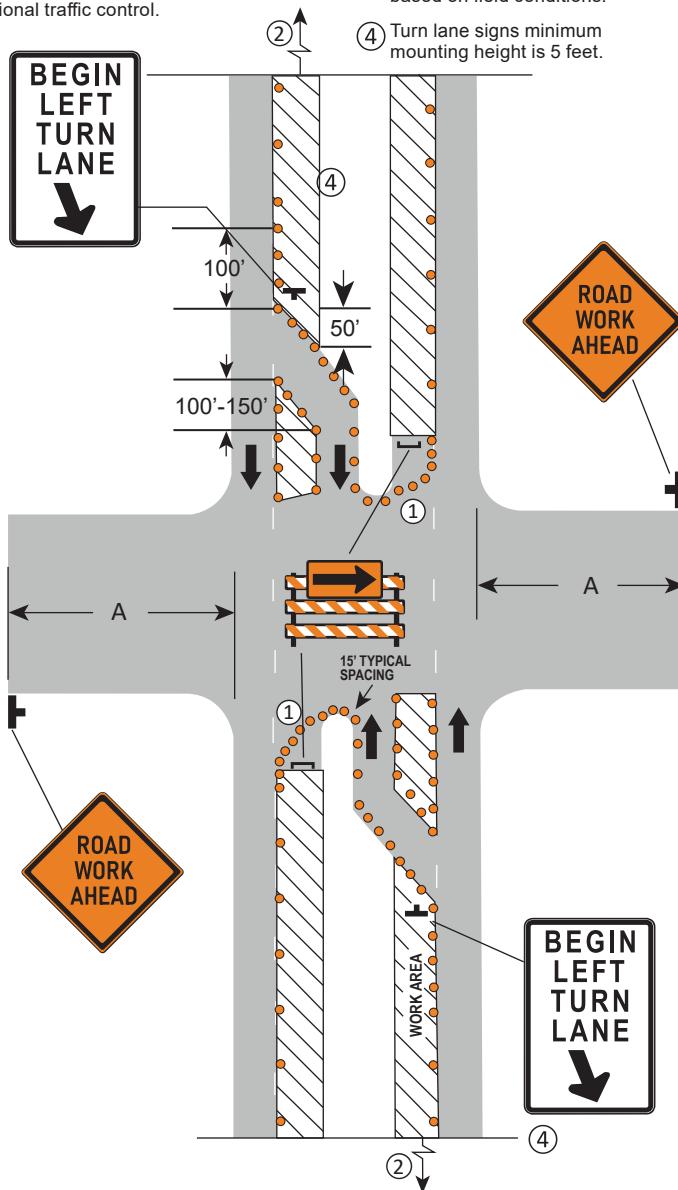
- ① Also use barricade and 15-foot typical drum spacing at commercial driveways.
- ② See separate lane closure detail for additional traffic control.
3. Provide turn lanes at intersections whenever staging of work allows. Taper and turn lane lengths based on field conditions.
- ④ Turn lane signs minimum mounting height is 5 feet.



RIGHT LANE CLOSURE AT INTERSECTION

NOTES:

- ① Also use barricade and 15-foot typical drum spacing at commercial driveways.
- ② See separate lane closure detail for additional traffic control.
- ③ Provide turn lanes at intersections whenever staging of work allows. Taper and turn lane lengths based on field conditions.
- ④ Turn lane signs minimum mounting height is 5 feet.



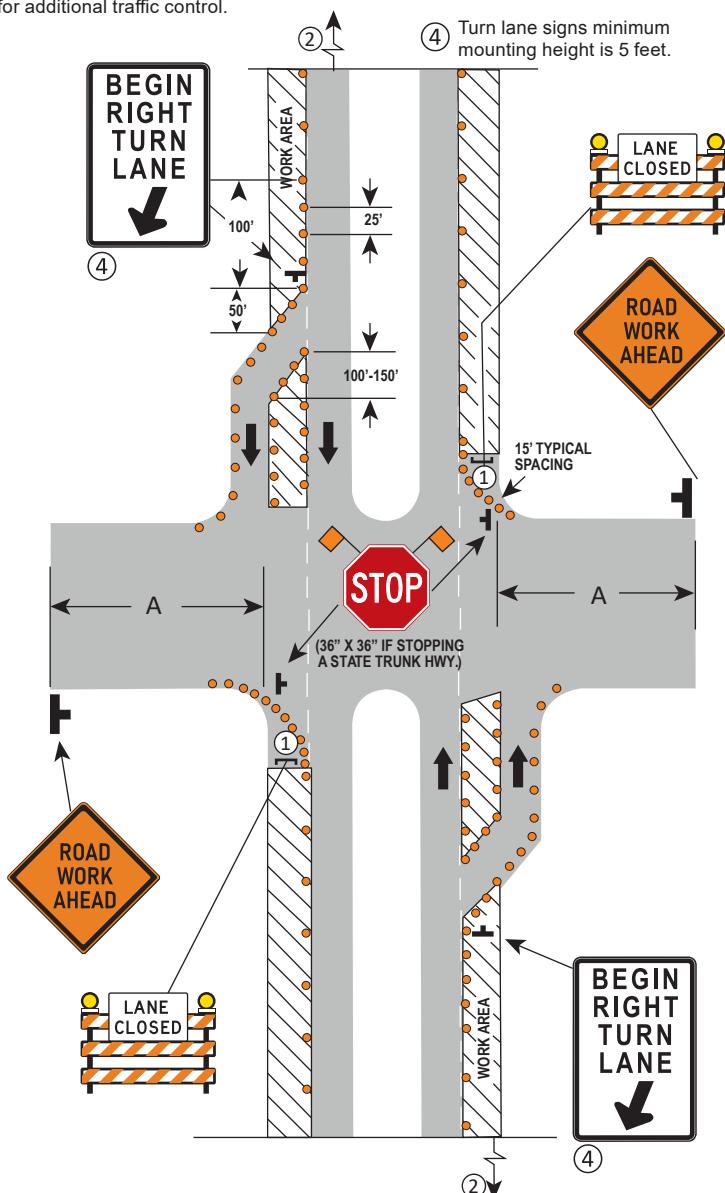
**LEFT LANE CLOSURE AT INTERSECTION OR MEDIAN
OPENING (WITH LEFT TURN BAY OPEN)**

3 DAYS or LESS

LAYOUT 74

NOTES:

- ① Also use barricade and 15-foot typical drum spacing at commercial driveways.
- ② See separate lane closure detail for additional traffic control.



**RIGHT LANE CLOSURE AT INTERSECTION
(WITH RIGHT TURN BAY OPEN)**

3 DAYS or LESS

LAYOUT 75

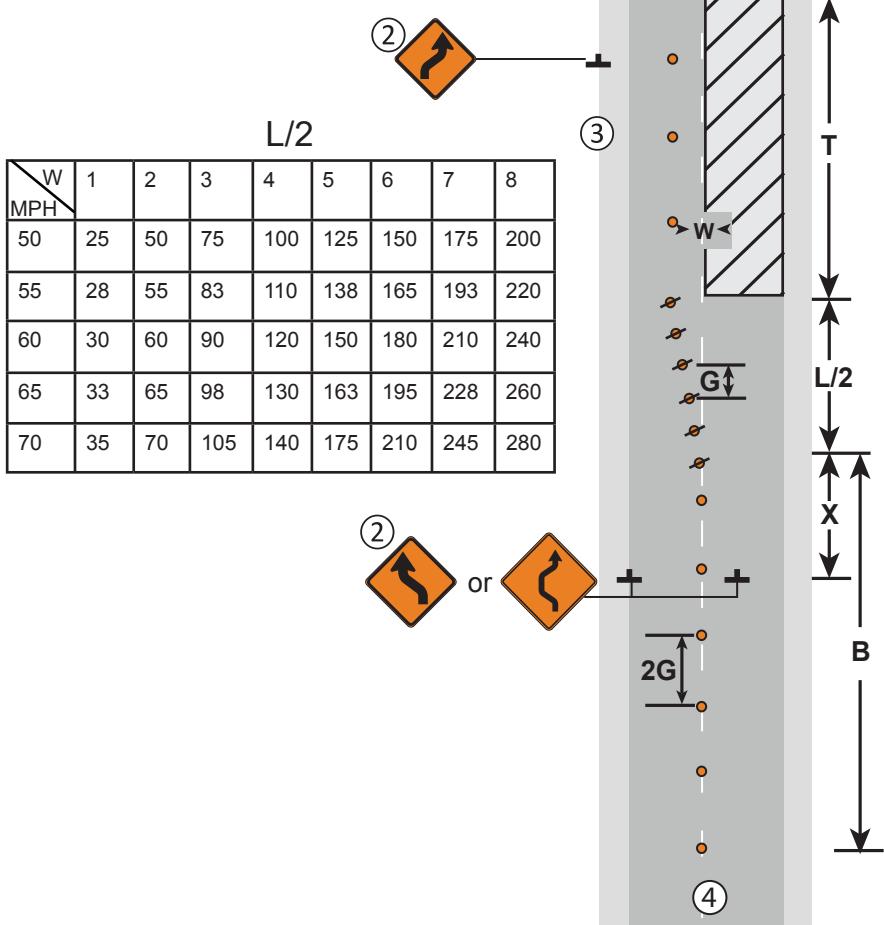
MISCELLANEOUS LAYOUTS

Refer to the layouts for roadway type, volume, or speed limit restrictions.

Miscellaneous Operations	
	Layout Number
Striping Operations - Two-Lane Roads	77
Striping Operations - Multi-Lane Roads	78, 79
Off Road Operation	8
Motor Grader - Gravel Road Maintenance	26
Flagging Cross-Roads and blind curves	18
Flagging at Moving Work Spaces	16
Surfacing Operation at Intersection	61
Lane Closure, Single Lane Roundabout	82
Left Lane Closure, 2 Lane Roundabout	83
Right Lane Closure, 2 Lane Roundabout	84
Typical Bump/Dip	80
Controlled Burn	81
Crossroad and Confirmation Signing	31
Drop-Off Signing	87
Closures	
Layouts for closures of roadway, bicycle, or pedestrian facilities	Layout Number
Two-Lane, Two-Way Road Closure	27
Multi-Lane Undivided Road Closure	44
Sidewalk Detour	85
Sidewalk Bypass	86

NOTES:

1. Do not shift traffic onto gravel shoulders.
- ② If T is greater than 600' use reverse curve signs.
- ③ Maintain 12 feet of paved surface.
- ④ Use other layout for lane closures and advance warning.



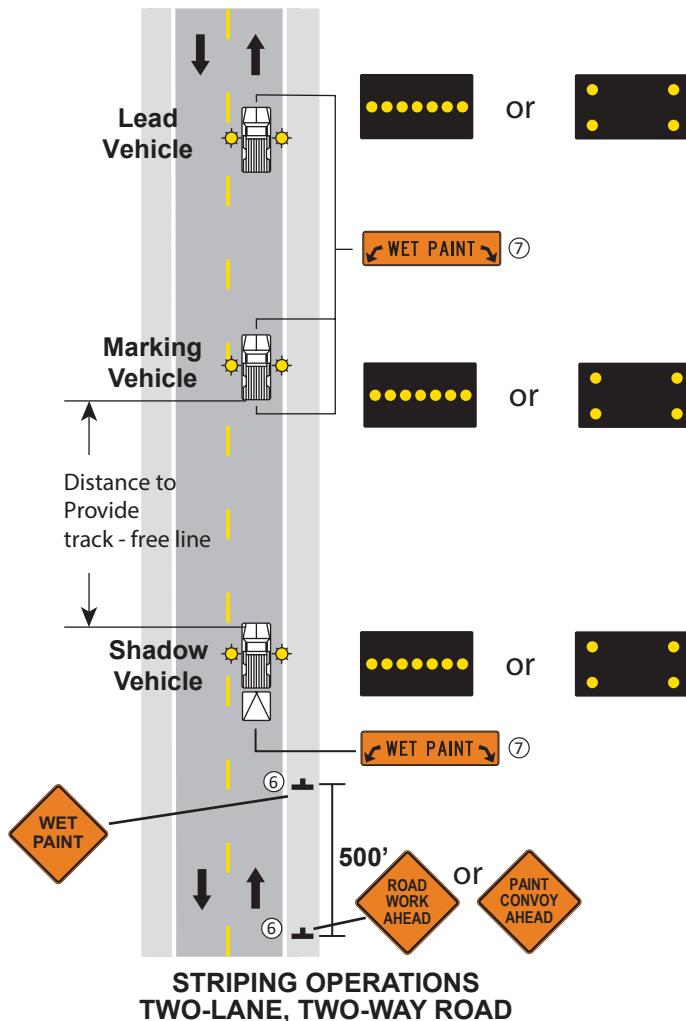
LANE SHIFT TO SHOULDER

12 HOURS or LESS

LAYOUT 76

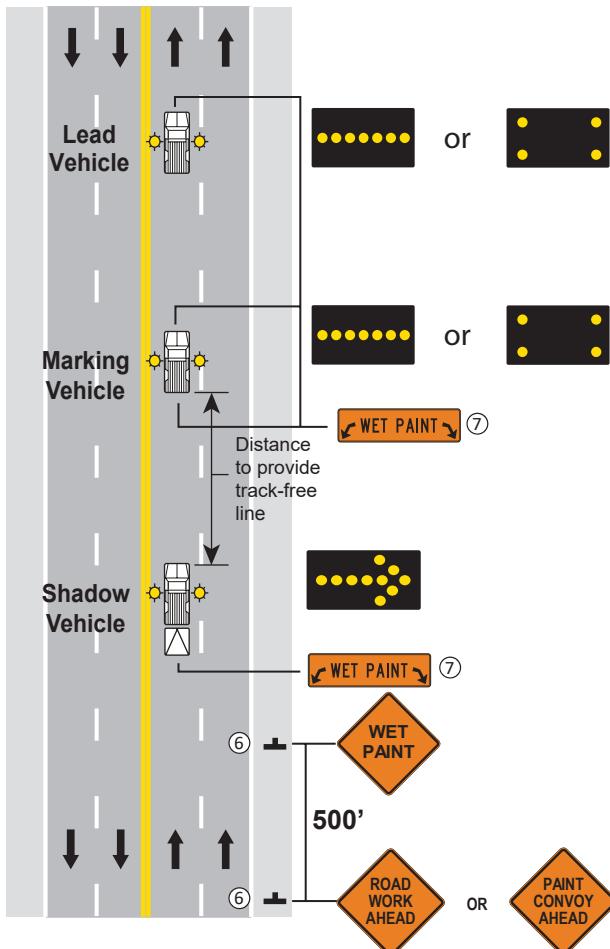
NOTES:

1. All vehicles shall display two 360-degree yellow flashing vehicle lights or strobes.
 2. The separation distance between the Marking Vehicle and the Shadow Vehicle should be determined by the track free time of the pavement marking material and/or traffic conditions.
 3. Any shadow vehicle(s) operated totally or partially in a high speed traffic lane shall be equipped with a TMA.
 4. If tracking of the wet paint is anticipated, cones should be used between the Marking and Shadow Vehicles at 100 foot spacing.
 5. Approach signs are the same in all directions.
- (6) Signs shall be repeated approximately every three miles.
- (7) Cover the appropriate arrow of the truck mounted "WET PAINT" sign.



NOTES:

1. All vehicles shall display two 360-degree yellow flashing vehicle lights or strobes.
 2. The separation distance between the Marking Vehicle and the Shadow Vehicle should be determined by the track free time of the pavement marking material and/or traffic conditions.
 3. Any shadow vehicle(s) operated totally or partially in a high speed traffic lane shall be equipped with a TMA.
 4. If tracking of the wet paint is anticipated, cones should be used between the Marking and Shadow Vehicles at 100 foot spacing.
 5. Approach sign are the same in all directions.
- ⑥ Signs shall be repeated approximately every three miles.
- ⑦ Cover the appropriate arrow of the truck mounted "WET PAINT" sign.



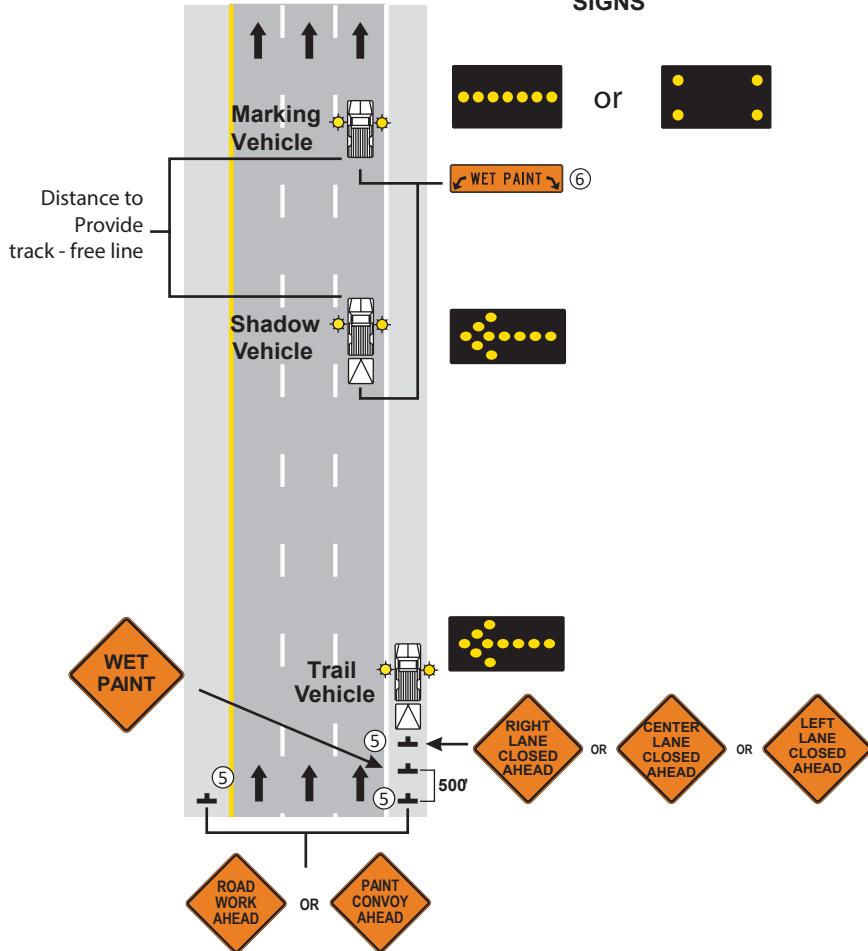
**STRIPING OPERATIONS
CENTERLINE - LANE LINE - EDGELINE STRIPING
FOUR-LANE UNDIVIDED ROAD**

15 MINUTES or LESS

LAYOUT 78

NOTES:

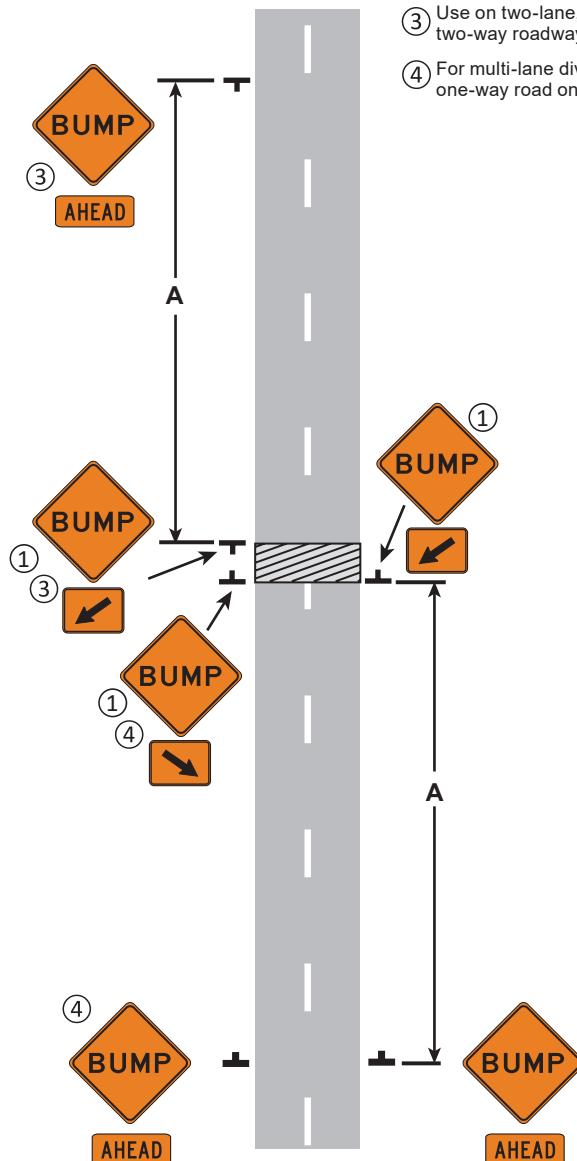
1. All vehicles shall display two 360-degree yellow flashing vehicle lights or strobes.
 2. The separation distance between the Marking Vehicles and the Shadow Vehicle should be determined by the track free time of the pavement marking material.
 3. Any Shadow or Trail Vehicles operated totally or partially in a high speed traffic lane shall be equipped with a TMA.
 4. If tracking of the wet paint is anticipated, cones should be used between the Marking and Shadow Vehicles at 100 foot spacing.
- (5) Signs shall be repeated approximately every three miles and after every on ramp.
 (6) Cover the appropriate arrow of the truck mounted "WET PAINT" sign.

REAR FACING SIGNS

**STRIPING OPERATIONS
LANE LINE STRIPING
MULTI-LANE DIVIDED ROAD**

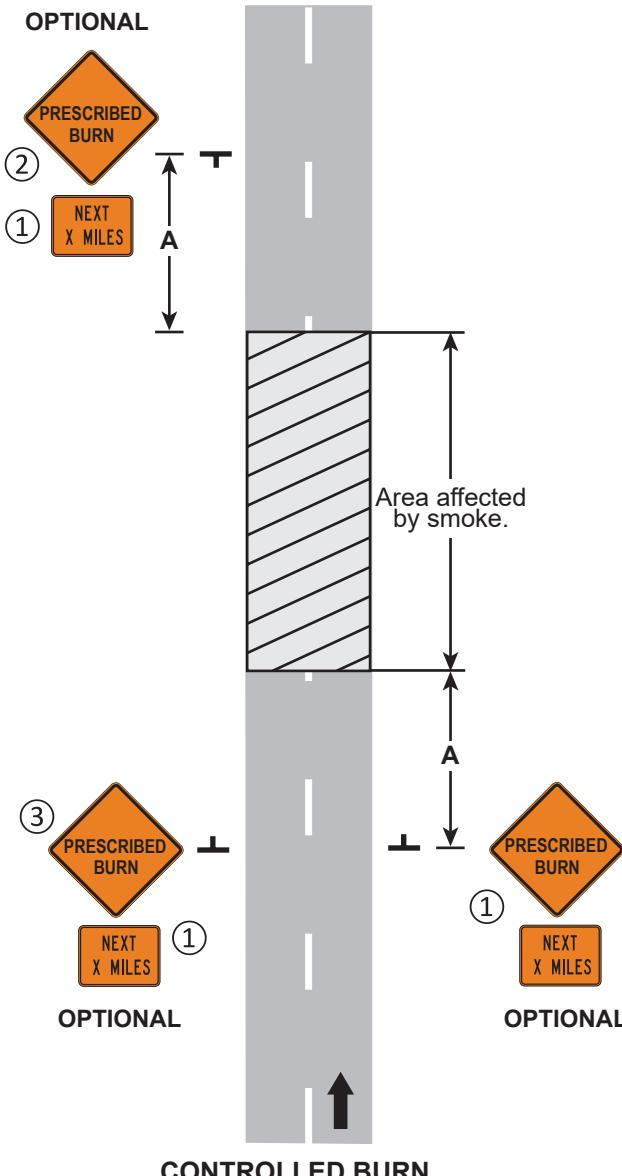
NOTES:

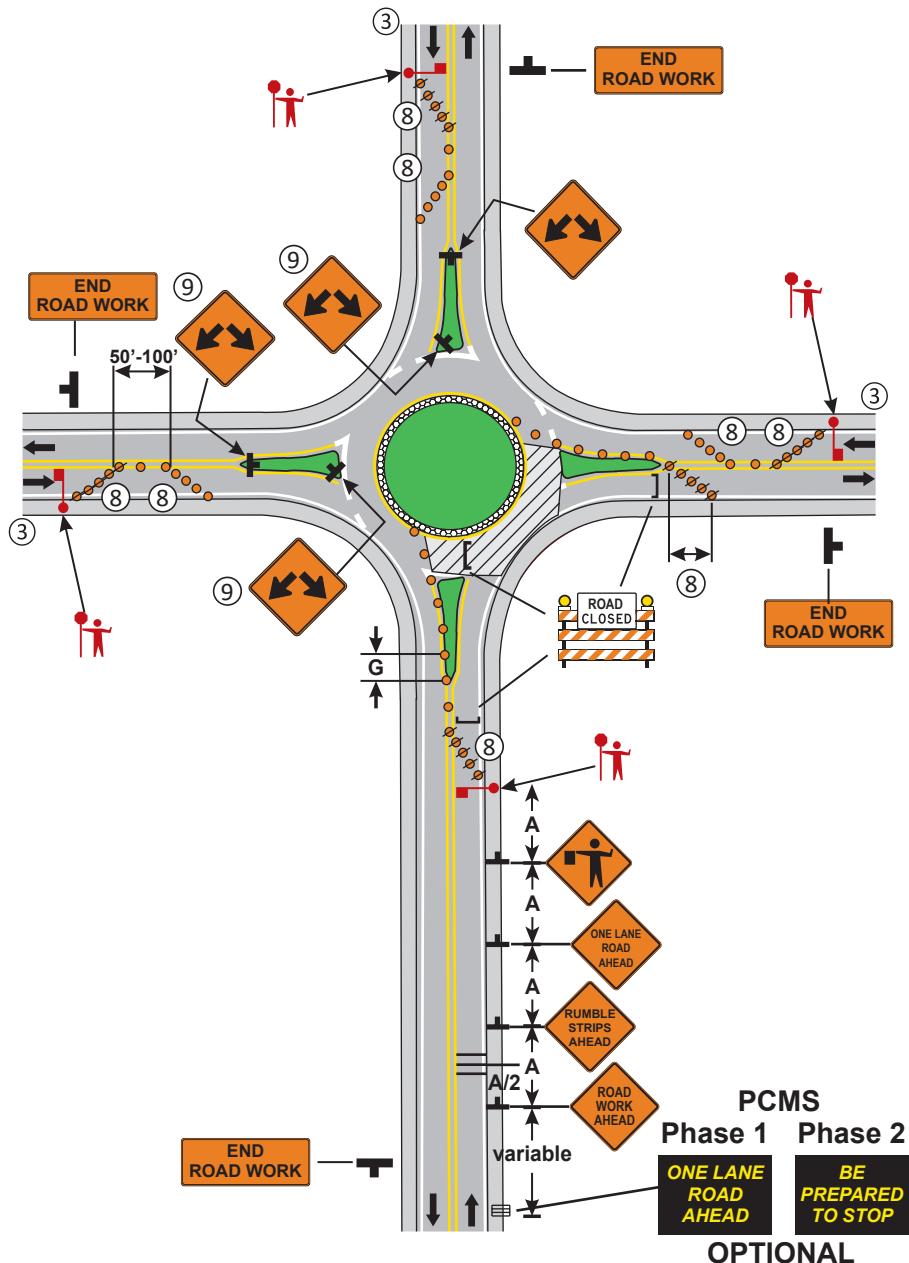
1. Multiple bumps should use BUMPS sign.
2. When a dip, use DIP signs.
3. Use on two-lane, two-way roadways.
4. For multi-lane divided or one-way road only.

**TYPICAL BUMP/DIP SIGNING**

NOTES:

- (1) When the optional NEXT X MILES plaque(s) is used, it shall be placed directly below or on the lower side nearest traffic of the appropriate warning sign(s).
- (2) Use on two-lane, two-way roads.
- (3) For multi-lane divided or one-way roadways.





LANE CLOSURE IN ROUNDABOUT SINGLE LANE ROUNDABOUT

12 HOURS or LESS

LAYOUT 82

NOTES:

1. Each roundabout is unique and traffic control shall be developed to meet the specific conditions of the location and the work operation. A detour could better serve traffic movement and shall be considered as an alternative to the flagger operation.
2. Flagging operations may not be necessary when working on the shoulders or in the island of the roundabout. If a driving lane(s) width of at least 10 feet (or more) can be maintained while shoulder work on an approach is being performed, the driving lane(s) may remain open to traffic.
- (3) Approach signs are the same in all directions.
4. Flaggers shall control traffic flow on all approaches of the one-lane roundabout.
5. A lead flagger shall be designated and radio communication shall be used by the flaggers.
6. Only one approach of traffic shall be released at a time.
7. At night, flagger stations shall be illuminated. Street lights and vehicle headlights shall not be used to illuminate the flagger station.
- (8) The two-way taper should be 50 feet using 5 equally spaced channelizing devices.
- (9) The Double Arrow sign may be replaced with destination signing.
10. When available width is less than 16 feet, a Max Width (W12-52) sign should be used with a posted width 1 foot less than available width.

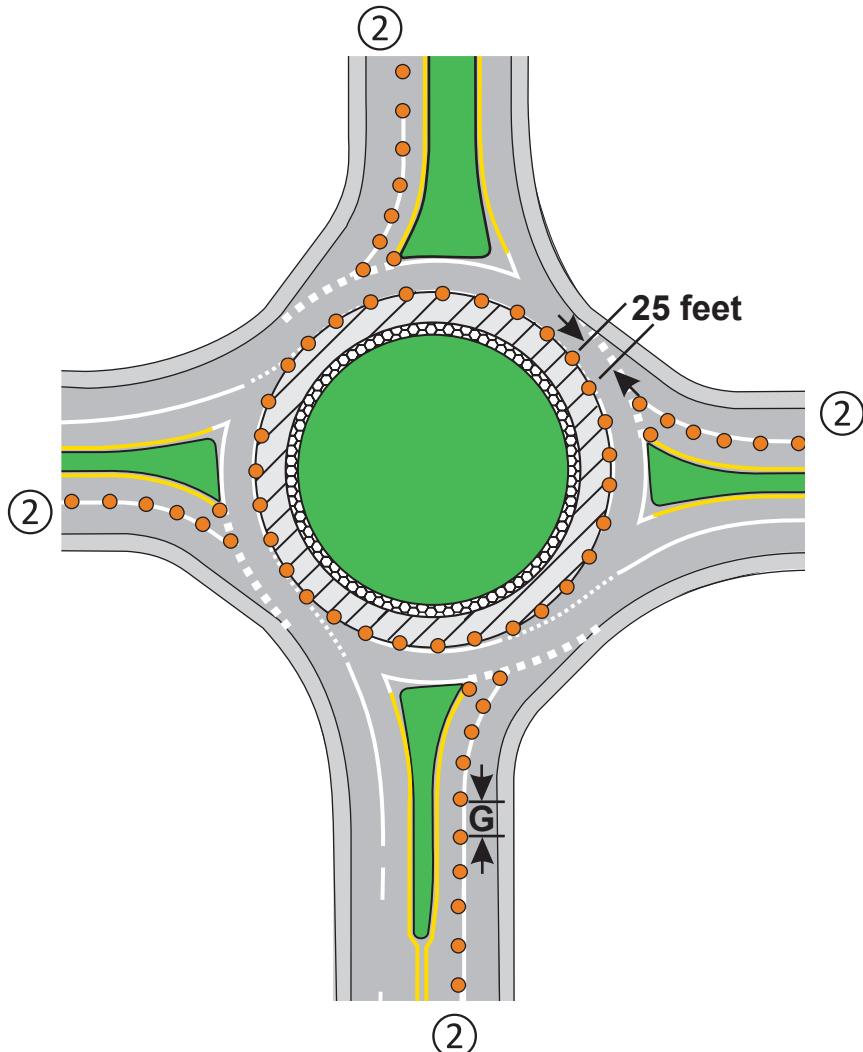
**LANE CLOSURE IN ROUNDABOUT
SINGLE LANE ROUNDABOUT**

12 HOURS or LESS

LAYOUT 82

NOTES:

1. Each roundabout is unique and traffic control shall be developed to meet the specific conditions of the location and the work operation. A detour could better serve traffic movement and shall be considered as an alternative to the flagger operation.
2. Use other layouts for lane closures and advance warning.
3. On divided highways having a median wider than 6 feet, right and left sign assemblies shall be required.
4. Consideration should be given to truck/bus traffic.
5. END ROAD WORK sign should be plated 500 feet past work area.



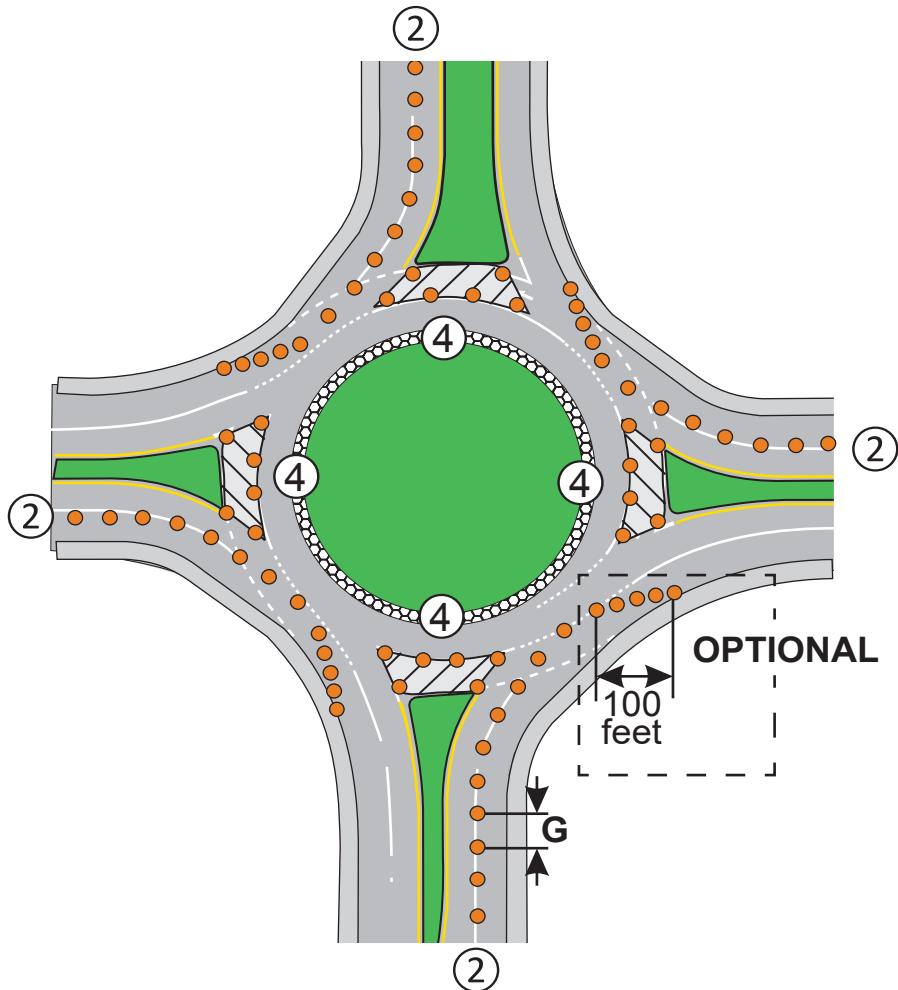
**LEFT LANE CLOSURE IN ROUNDABOUT
TWO-LANE ROUNDABOUT**

3 DAYS or LESS

LAYOUT 83

NOTES:

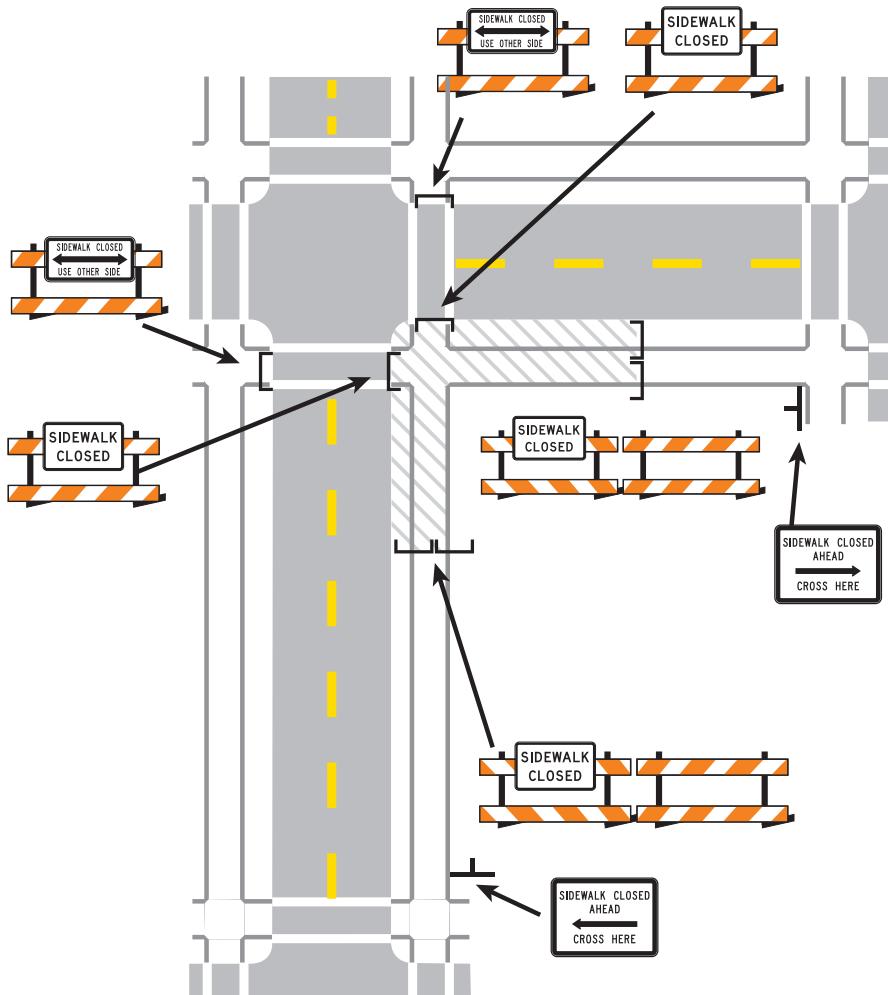
1. Each roundabout is unique and traffic control shall be developed to meet the specific conditions of the location and the work operation. A detour could better serve traffic movement and shall be considered as an alternative to the flagger operation.
- ② Use other layouts for lane closures and advance warning.
3. On divided highways having a median wider than 6 feet, right and left sign assemblies shall be required.
- ④ The distance between channelizing devices should be 10 feet or adjusted for local conditions.
5. Consideration should be given to truck/bus traffic.
6. END ROAD WORK sign should be placed 500 feet past work area.



**RIGHT LANE CLOSURE IN ROUNABOUT
TWO-LANE ROUNABOUT**

3 DAYS or LESS

LAYOUT 84



**ALTERNATE PEDESTRIAN ROUTE
CROSSWALK CLOSURES AND PEDESTRIAN DETOURS
3 DAYS or LESS**

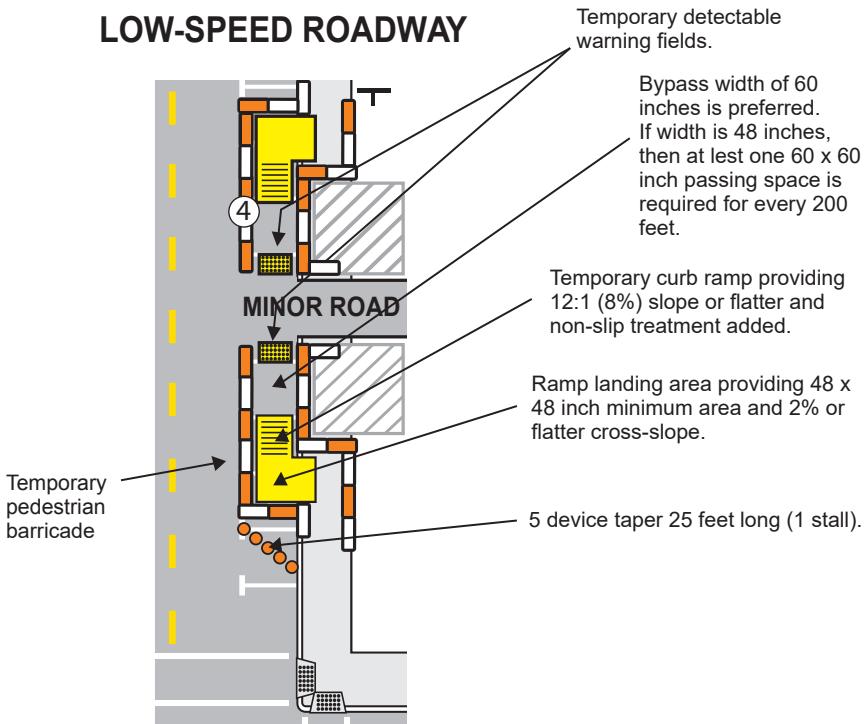
LAYOUT 85

NOTES:

1. When crosswalks, sidewalks, or other pedestrian facilities are blocked, closed, or relocated, temporary facilities shall include accessibility features consistent with the features present in the existing pedestrian facility.
2. When a sidewalk is closed, but workers are present, to halt operations and provide adequate passage through the work site, the devices shown are not required. Pedestrians may be delayed for a short period of time for project personnel to move equipment and material to facilitate passage. Project personnel may also assist pedestrians in navigating the work zone.
3. The examples show only key typical dimensions.
4. Only traffic control devices controlling pedestrian flows are shown. Other devices may be needed to control traffic on the streets.
5. Pedestrian traffic signal displays controlling closed crosswalks shall be covered.
6. Pedestrian detour trailblazing signs should be used if the pedestrian detour is located someplace other than across the street from the sidewalk closure.
7. Place signs and barricades in such a way as to minimize hazard to pedestrians from walking into signs. If not possible, protect with detectable edges and/or channelizing devices. The Double Arrow sign may be replaced with destination signing.

NOTES:

1. When crosswalks, sidewalks, or other pedestrian facilities are blocked, closed, or relocated, temporary facilities shall include accessibility features consistent with the features present in the existing pedestrian facility.
 2. When a sidewalk is closed, but workers are present, to halt operations and provide adequate passage through the work site, the devices shown are not required. Pedestrians may be delayed for a short period of time for project personnel to move equipment and material to facilitate passage. Project personnel may also assist pedestrians in navigating the work zone.
 3. The examples show only key typical dimensions.
- ④** Only traffic control devices controlling pedestrian flows are shown.
Other devices may be needed to control traffic on the streets.



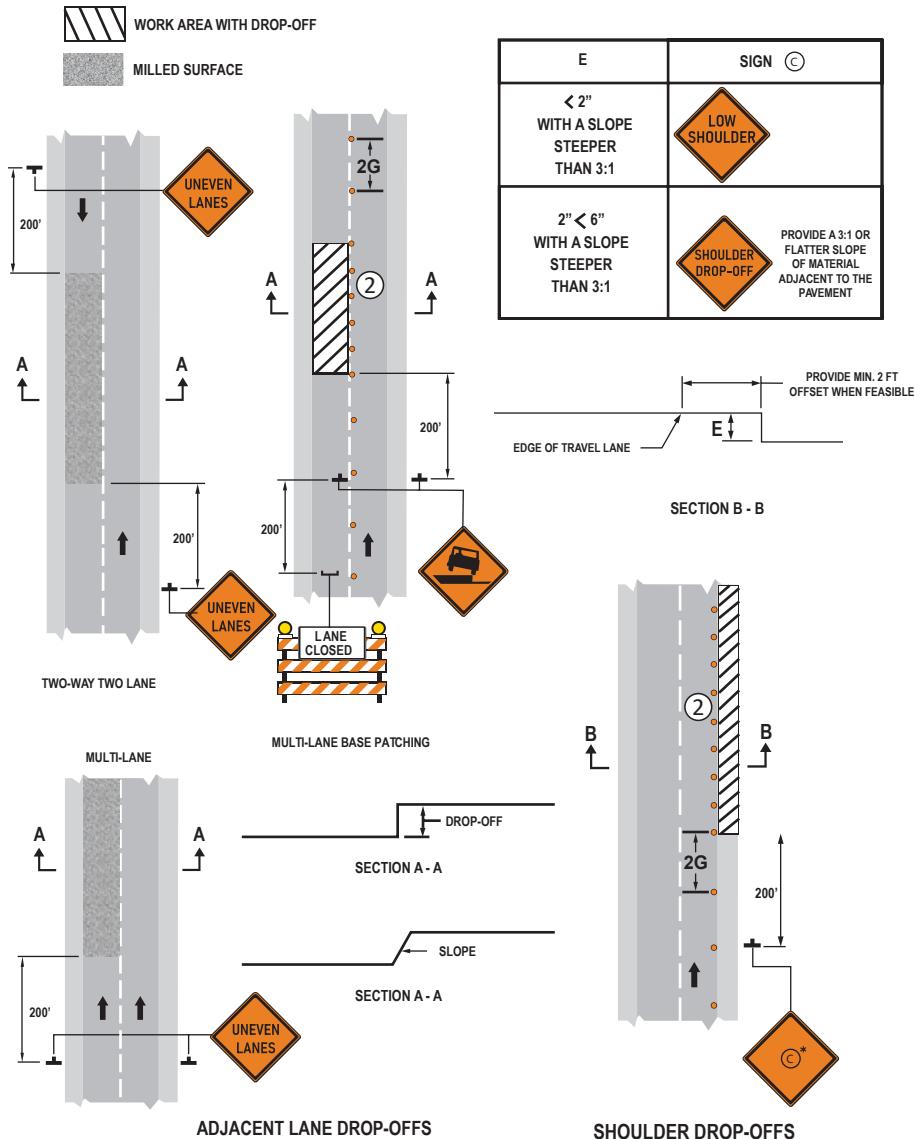
ALTERNATE PEDESTRIAN ROUTE SIDEWALK BY-PASS

3 DAYS or LESS

LAYOUT 86

NOTES:

1. *If the drop-off is continuous along the project, place additional signs every 1 mile and after each entrance ramp.
- ② Use closer spacing when delineating drop-off.



Quality Classifications and Requirements

Temporary Traffic Control (TTC) devices in this standard have been divided into three quality classifications: Acceptable, Marginal, and Unacceptable.

1. **Acceptable Devices** meet WMUTCD requirements such as design, size, color, weight, etc., are properly placed as specified, and clearly perform their intended function.
2. **Marginal Devices** are considered marginally acceptable or reaching the lower end of acceptability.
3. **Unacceptable Devices** shall not be delivered to the job site.

The required minimum percentage of acceptable devices has been established for each type of device and varies upon the duration of the Temporary Traffic Control (TTC) zone.

Intermediate-and Long-Term Duration

The following requirements shall be followed for TTC zones that are to remain in-place for more than twelve (12) hours:

- At the time of the initial set up or at the time of major stage changes, one hundred percent (100%) of each type of device (channelizers, barricades, signs, warning lights, arrow boards, portable changeable message signs, pavement tape, and raised pavement markers) shall be classified as "acceptable".
- Throughout the duration of the project, the number of acceptable devices may decrease to seventy-five percent (75%) of the initial quantity of each particular device, as a result of damage and/or deterioration during the course of the work with the remainder of the devices in the "marginal" category.
- Devices in the marginal category may remain in the TTC zone until their total number exceeds the twenty-five percent (25%) maximum for that type of device, which is considered an "unacceptable" situation. Should the percentage of devices in the marginal category exceed twenty-five (25%), all marginal devices shall be replaced so as to bring the group of devices back up to acceptable standards.
- All devices categorized as unacceptable shall be replaced within twelve (12) hours of notification.
- Missing or knocked-down devices should be replaced or reset in a timely manner.

For Concrete Barrier Temporary Precast, see the CMM 1.45.12.

Short-Term Duration

The following requirements may be followed for TTC zones that are to remain in place for less than twelve (12) hours:

- At the time of the initial set up, one hundred percent (100%) of all TTC devices except channelizing devices and barricades shall be classified as "acceptable". During the short term duration of the project, the intermediate-and long-term duration standards shall be maintained for these devices.
- At the time of the initial set up, a minimum of seventy-five percent (75%) of each type of channelizer and barricade shall be classified as "acceptable". Up to a maximum of twenty-five percent (25%) of these devices may be classified as "marginal". "Unacceptable" devices shall not be installed.
- During the short-term duration of the project, the number of marginal devices may increase beyond the twenty-five percent (25%) of the initial quantity, as a result of damage and/or deterioration during the course of the work.
- Missing or knocked-down devices should be replaced or reset in a timely manner.

The following descriptions, together with the accompanying photographs, should be used to determine if a device is acceptable, marginal, or unacceptable.

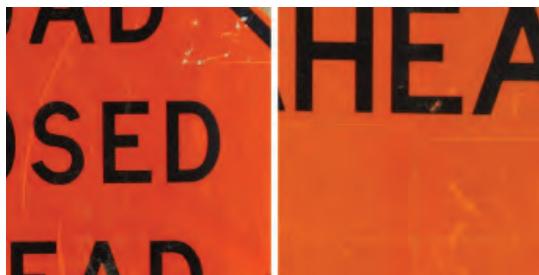
EVALUATION GUIDE: Warning Signs

Acceptable

To be considered acceptable, a sign shall meet all of the following conditions:

- There may be several abrasions on the surface, but very little loss of lettering.
- There has been no touch-up of the lettering.
- The message is legible both day and night.
- Sign faces shall be approximately perpendicular to the roadway. Post-mounted signs are no more than 3 inches out-of-plumb for the entire height of the assembly. Signs on portable stands are no more than 3 inches per foot out-of-plumb for the entire height of the assembly.
- The back side is free of any retroreflective materials except small logos or identification markings and have a bare surface or be painted a uniform color as approved by the road authority.
- The sign is in-place at the specified spacing and properly aligned to traffic.

Examples of “Acceptable” Warning Signs.



Marginal

Signs are considered marginal if they meet all conditions listed under acceptable with the exception of either of the following conditions:

- There are many surface abrasions throughout the sign face, and only a few are within the individual letters of the message.
- Some color fading may be evident, but the background color and retroreflectivity are still apparent at night.

Examples of “Marginal” Warning Signs.



EVALUATION GUIDE: Warning Signs, cont.

Unacceptable

A sign is considered unacceptable if it meets any of the following conditions:

- Asphalt splatter, cement slurry, other residue, or abrasions that are evident on the face of the sign.
- Portions of letters are missing such that they become confusing to identify.
- The message is illegible or defaced.
- There is noticeable color fading or loss of retroreflectivity at night.
- Sign face is not perpendicular to the roadway.
- Signs on post-mounted structures are installed more than 3 inches out-of-plumb for the entire height of the assembly.
- Signs on portable structures are more than 3 inches per foot out-of plumb for the entire height of the assembly.
- Signs are damaged or defaced in a way that they no longer have the same shape as a new sign.
- Signs have non-fluorescent orange sheeting.

Examples of “Unacceptable” Warning Signs.



EVALUATION GUIDE: Channelizing Devices

Acceptable

To be considered acceptable, a channelizing device shall meet all of the following conditions:

- The shape should remain clearly identifiable with no significant distortion and shall be free standing in its normal position.
- Surface is free of punctures and abrasions.
- Surface is free of asphalt splatter, cement slurry, or other material, and will readily respond to washing.
- The retroreflective bands have little or no loss of retroreflectivity, with only minor tears and scratches.
- Any dents do not seriously reduce the retroreflectivity of the sheeting.
- Fluorescent sheeting is used.

Examples of “Acceptable” Channelizing Devices.



Marginal

The channelizing device is considered marginal if it meets any of the following conditions:

- The surface has some asphalt splattering or cement slurry and may not be readily cleaned due to abrasions and discoloration.
- The retroreflective bands have numerous tears and scratches, but have no large areas of residue or missing retroreflective material.
- Any dents do not reduce the strength of the device.
- Fluorescent sheeting is used.

Examples of “Marginal” Channelizing Devices.



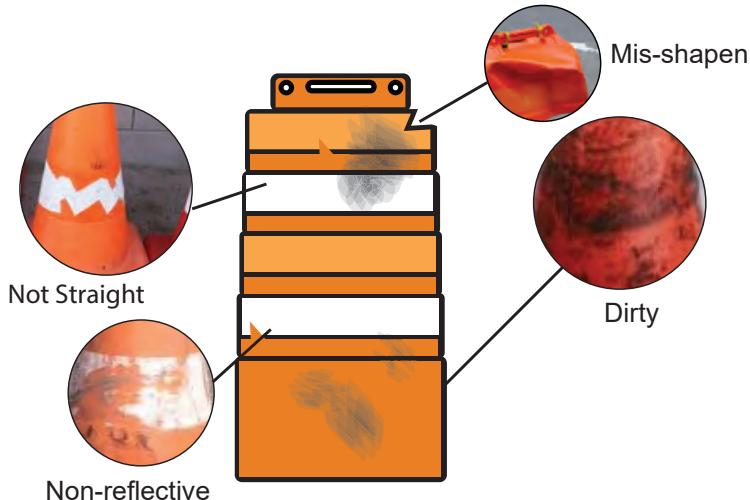
EVALUATION GUIDE: Channelizing Devices, cont.

Unacceptable

A channelizing device is considered unacceptable if it meets any of the following conditions:

- Punctures and large areas of staining asphalt splatter or cement slurry that cannot be cleaned due to abrasions or discoloration.
- There is noticeable fading of the device's color.
- Large areas of missing or stained retroreflective material.
- Substantial deformation of a device, which reduces the original dimensions, or the device has lost the intended shape.
- Several dents or fractures that affect their stability or ability to retain the retroreflective sheeting.
- Non-fluorescent orange sheeting is used.

Examples of “Unacceptable” Channelizing Devices.



EVALUATION GUIDE: Type II, or III Barricade Panels or Vertical Panels

Acceptable

To be acceptable, the panel shall meet all of the following conditions:

- Panels are not deformed to an extent so as to decrease the panels target value.
- There may be several abrasions on the surface but very little loss of retroreflective sheeting.
- The orange is vivid and the stripes provide contrast.
- The Type III barricade has been fabricated according to the approved crashworthy requirements.



Marginal

The panel is considered marginal if it meets any of the following conditions:

- Panels are not deformed to an extent so as to decrease the panels target value.
- There are numerous surface abrasions through the panel surface.
- Some color fading is evident; however, it has no large areas of residue or missing retroreflective material.
- The Type III barricade has been fabricated according to the approved crashworthy requirements.



Unacceptable

A panel is considered unacceptable if it meets any of the following conditions:

- The surface is marred over a high percentage of the panel area.
- There is a noticeable loss of retroreflectivity and obvious color fading.
- Panels with asphalt splatter, cement slurry, and/or other residue or any combination of missing and covered retroreflective material.
- Barricades have bent or twisted legs, or deformation of the support assembly to the extent that the barricade panel is not reasonably parallel to the roadway surface.



EVALUATION GUIDE: Warning Lights

Acceptable

To be acceptable, warning lights shall meet all of the following conditions:

- One hundred percent (100%) of all warning lights shall be operating properly. Any warning light that is out of alignment from the intended driver's line of vision is considered not operating properly.
- Type A Low-Intensity Flashing warning lights and Type C Steady-Burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3000 feet.
- Type B High-Intensity Flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1000 feet.
- Warning lights shall have a minimum mounting height of 30 inches to the bottom of the lens.

Marginal

The warning light is marginal when it meets any of the following conditions:

- Type A and C warning lights - at least ninety percent (90%) of the warning lights shall be operating properly with no more than three (3) adjacent lights failing.
- Type B warning lights - one (1) light failing.

Unacceptable

A warning light is considered unacceptable if it meets any of the following conditions:

- Type A and C warning lights - less than ninety percent (90%) of the warning lights operating properly, or more than three (3) adjacent lights failing.
- Type B warning lights - more than one (1) light failing.

EVALUATION GUIDE: Arrow Boards

Acceptable conditions for all arrow boards

An arrow board is acceptable if it meets all of the following conditions:

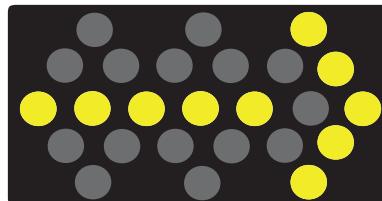
- All lamps are properly aligned for the intended driver's line of vision. Any operating lamp which is out of alignment shall be considered not functioning properly.
- No lamps are burned out.
- All lamps dim properly.
- All lamps are the same level of intensity.

Unacceptable conditions only for truck or trailer-mounted arrow boards

An arrow board is unacceptable if it meets any of the following conditions:

- The arrow board is not within 3 inches of plumb for the height of the board.
- The trailer-mounted arrow board is not raised to at least 7 feet above the roadway surface (measured to the bottom of the board).
- The truck-mounted arrow board is mounted less than 5 feet above the roadway surface (measured to the bottom of the board) unless the road authority determines the height is as high as practical.

FLASHING ARROW MODE



Marginal

An arrow board in this mode is marginal if it meets the following condition:

- Up to two (2) lamps out in the stem and no lamps out in the head.
- Arrow panel not dimming properly.

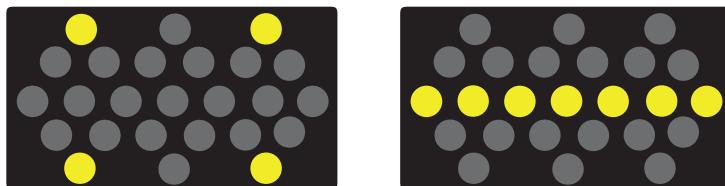
Unacceptable

An arrow board in this mode is unacceptable if it meets any of the following conditions:

- Any lamp out in the head.
- More than two (2) lamps out in the stem.
- The arrow board message is not visible at 1 mile in advance of lane closure taper.
- Arrow panel not dimming properly.
- **Sequential arrow mode used.**

EVALUATION GUIDE: Arrow Boards, cont.

CAUTION MODE (4 Corners or Bar)



Marginal

An arrow board in this mode is marginal if it meets the following condition:

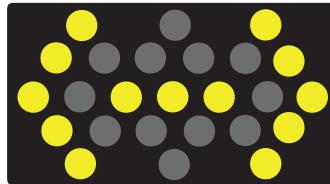
- At least four (4) lamps functioning properly on the bar, dimming properly.

Unacceptable

An arrow board in this mode is considered unacceptable if it meets any of the following conditions:

- Less than four (4) lamps functioning properly (on the 4 Corners or Bar)
- The arrow board message is not visible at 1 mile in advance of beginning of lane closure.
- Arrow panel not dimming properly.

DOUBLE ARROW MODE



Marginal

An arrow board in this mode is marginal if it meets the following condition:

- Two (2) lamps out in the stem and both heads completely functional with no lamps out, dimming properly.

Unacceptable

An arrow board in this mode is considered unacceptable if it meets any of the following conditions:

- More than two (2) lamps out in the stem.
- One (1) or more lamp out in the head.
- The arrow board message is not visible at 1 mile in advance of beginning of lane closure taper.
- Arrow panel not dimming properly.

EVALUATION GUIDE: Portable Changeable Message Signs (PCMS)

Acceptable

A PCMS is acceptable if it meets the following condition:

- One hundred percent (100%) of the pixels per character module shall be operating properly.

Marginal

A PCMS is marginal if it meets the following condition:

- At least ninety percent (90%) of the pixels per character module shall be operating properly.

Unacceptable for all PCMSs

A PCMS is unacceptable if it meets any of the following conditions:

- Less than ninety percent (90%) of the pixels per character module are operating properly.
- The PCMS is not properly aligned for the intended driver's line of vision.
- The PCMS message is not legible.
- The sign panel more than 3 inches out of plumb.
- The sign panel is raised less than 5 feet above the roadway surface on rural roadways or less than 7 feet on urban roadways (measured to the bottom of the board).

EVALUATION GUIDE: High Visibility-Work Zone Safety Apparel

Acceptable

Safety apparel is acceptable if it meets the following conditions:

- Vivid color contrast and high reflectivity

Marginal

Safety apparel is marginal if it meets the following conditions:

- Good reflectivity although apparel has some soiling and light fading

Unacceptable

Safety apparel is unacceptable if it meets any of the following conditions:

- Little or no reflectivity, and soiled and faded material.
- Deteriorated reflective strips.

EVALUATION GUIDE: Trailer-Mounted Electronic Traffic Control Devices

This includes devices such as Automated Flagger Assistance Devices (AFADs), Portable Traffic Signals, and Dynamic Speed Display Signs.

Acceptable

An electronic traffic control device is acceptable if it meets all of the following conditions:

- The device shall be operating correctly for its intended usage within allowable tolerances and with all fail-safes properly functioning.
- All lamps, LED displays, and signs are properly aligned for the intended driver's line of vision. Any operating lamp, LED display, or sign which is out of alignment shall be considered not functioning properly.
- One hundred percent (100%) of the LED pixels per character module are operating properly.
- One hundred percent (100%) of the lamps are operational.
- All lamps and LED displays dim properly.
- The signs meet or exceed the quality standards for acceptable "Warning Signs".
- The device's leveling stands shall be adjusted to properly plumb the device.
- The bottom of any overhead signal head shall be between 17 and 19 feet above the roadway surface.

Marginal

An electronic traffic control device is marginal if it meets the following conditions:

- At least ninety percent (90%) of the LED pixels per character module are operating properly.
- The signs meet the quality standards for marginal "Warning Signs".

Unacceptable

An electronic traffic control device is unacceptable if it meets any of the following conditions:

- The device is malfunctioning for any of its intended functions including but not limited to signal operations, radio communications, detection, or message display.
- Any of the lamps are burned out.
- Less than ninety percent (90%) of the LED pixels per character module are operating properly.
- The device is not properly aligned for the intended driver's line of vision.
- The lamps and LED displays are not dimming properly.
- The device is not within 3 inches of plumb for the height of the device (excluding an overhead signal head mast).
- The bottom of any overhead signal head is lower than 17 feet or higher than 19 feet above the roadway surface.