

**Field Guide on
Installation and Removal of
Temporary Traffic Control for
Safe Maintenance and
Work Zone Operations**



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Introduction

This field guide provides field personnel with introductory guidance on installation and removal methods for temporary traffic control (TTC) zones. Proper setup and operation of temporary traffic control zones improves the safety of those working near traffic and is of the utmost importance. It is important to remember that temporary traffic control field personnel are most vulnerable during installation and removal of temporary traffic control devices.

As noted in the Manual on Uniform Traffic Control Devices (MUTCD), “The needs and control of all road users through a TTC zone shall be an essential part of highway construction, utility work, maintenance operations, and the management of traffic incidents.” Part 6B

Working near traffic requires training in safe practices, alertness, common sense, and a sense of responsibility. Workers are responsible for their own safety, the safety of other workers, the safety of the driving public, and the safety of pedestrians and bicyclists. Although maintenance and short-term work is not exposed to traffic as long, workers are still at risk during their activities. The following is a list of typical types of maintenance and short-term work that is performed:

- Bridge inspection.
- Cleaning drainage facilities - catch basins, drop inlets, etc.
- Debris cleanup - both routine cleanup and removal of debris, and emergency removal of storm debris and spilled material.
- Emergency repairs - miscellaneous operations necessary to restore safe highway operation that can be completed within a few minutes.
- Guardrail repair.

- Mowing in the highway right-of-way (ROW).
- Pavement marking installation and removal.
- Pavement repairs - limited in scope, such as pothole patching, sealing cracks and joints, and other small repairs.
- Post mounted delineators - repair, replacement, installation.
- Raised pavement markers - new installations and lens replacement.
- Shoulder rumble strips - installation.
- Small roadside signs - repair, replacement, installation.
- Snow removal and ice prevention.
- Surveying.
- Traffic signal repairs - routine lamp replacement and emergency repairs.
- Vegetation control - application of herbicides adjacent to shoulders.

High Visibility Safety Apparel

High visibility safety apparel is required for all workers within the highway right-of-way. The American National Standards Institute (ANSI) provides guidelines for high visibility safety apparel based on minimum areas of retroreflective material. Some guidelines are listed below.

- ANSI Class 2 apparel is required for all workers within the highway right-of-way.
- ANSI Class 3 apparel is recommended for some types of work.
- Class 3 vests are required to have sleeves, but retroreflective pants may be worn in addition to a Class 2 vest to also meet Class 3 standards.

Refer to <http://www.atssa.com> for additional information and products on high visibility safety apparel

Stationary Lane Closures

The following diagram illustrates a lane closure and the parts of a Temporary Traffic Control Zone (TTCZ) based on the MUTCD.

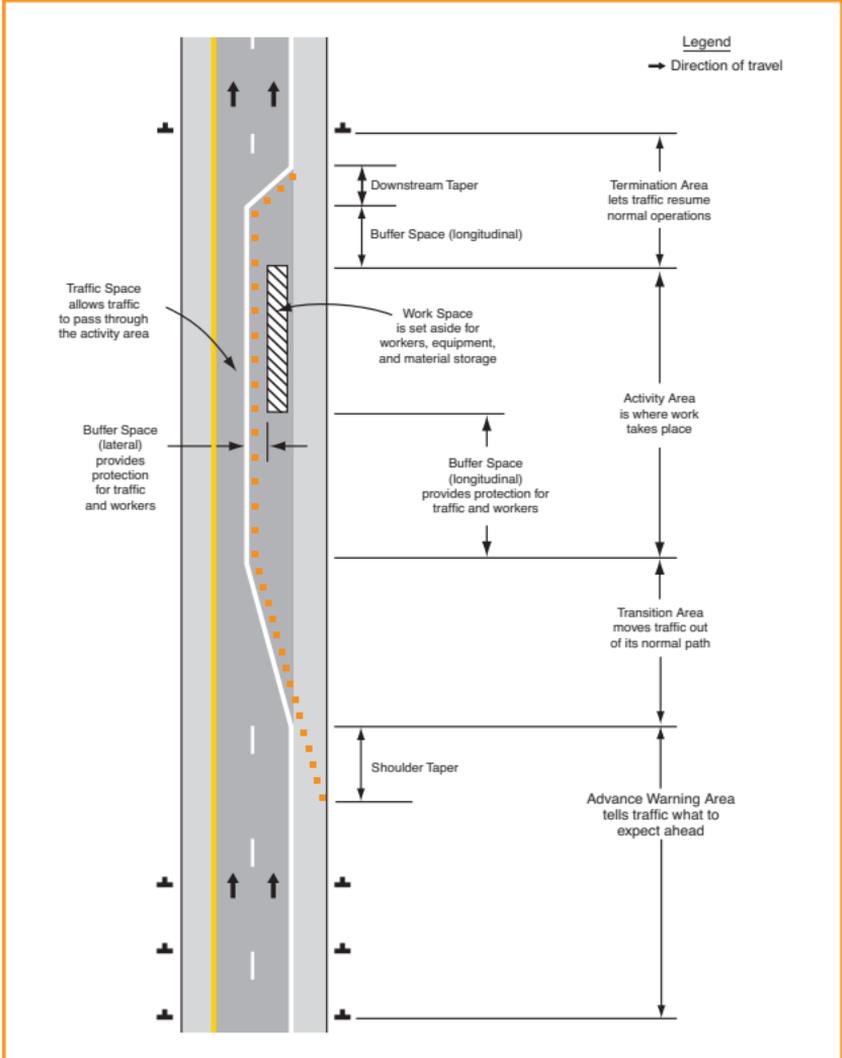


Figure 1. Component Parts of a Temporary Traffic Control Zone

Advance Preparation Checklist

1. Inventory the devices you plan to use – make sure they are all clean and in good working order.
2. Review the Traffic Control Plans for appropriate installation.
3. Discuss safe procedures with your team, including proper personal protective equipment.
4. Make sure workers have the proper training prior to assignment.
5. Identify appropriate emergency contacts.
6. Visit the site in advance to identify any potential issues.
7. Notify other personnel as needed (law enforcement, rescue, etc.).
8. Prior to installation, locate signs and other devices along the shoulder so they can be quickly moved into position.
9. Install the devices per the guidance in this manual for the appropriate operation.
10. Review your installation for good driver navigation and make adjustments as needed.

Steps to Install a Stationary Lane Closure on a Multi-Lane Highway

1. Locate the beginning of **Work Space** and mark the location (when using paint, use white or pink colors only, as other colors have designations for the type of utility being marked).
2. From the beginning of the **Work Space**, measure the buffer distance (empty space in advance of the work area) and mark the beginning of the **Buffer Space**.
3. From the beginning of the **Buffer Space**, measure the taper length and mark the beginning of the taper.
4. From the beginning of the taper, measure the advance warning sign spacing distances (see Figure 2) and mark each location.
5. Install advance warning signs in **Advanced Warning Area**, beginning with signs located on the right shoulder first, then signs on the left shoulder if applicable:
 - 1st sign—Attracts the driver's attention.
 - 2nd sign—Shows what the driver is approaching.
 - 3rd sign—Shows the driver what must be done.
6. Install Arrow Panel on shoulder prior to taper or as close to beginning of the taper as possible.
7. Install traffic control devices and arrow panel in the **Transition Area** with the flow of traffic. Use of a TMA on the lead vehicle or shadow vehicle is recommended during installation.
8. Install traffic control devices along the **Activity Area**:
 - Start installing along the **Buffer Space** with the flow of traffic
 - Continue placing devices along the **Work Space**.
9. Install traffic control devices for the **Termination Area** with the flow of traffic.

10. Inspect the work zone:

- Perform a drive through inspection.
- Document the observations.
- Correct any deficiencies.

11. Observe motorists driving through the work zone to look for trends in motorist difficulty in maneuvering through the work zone.

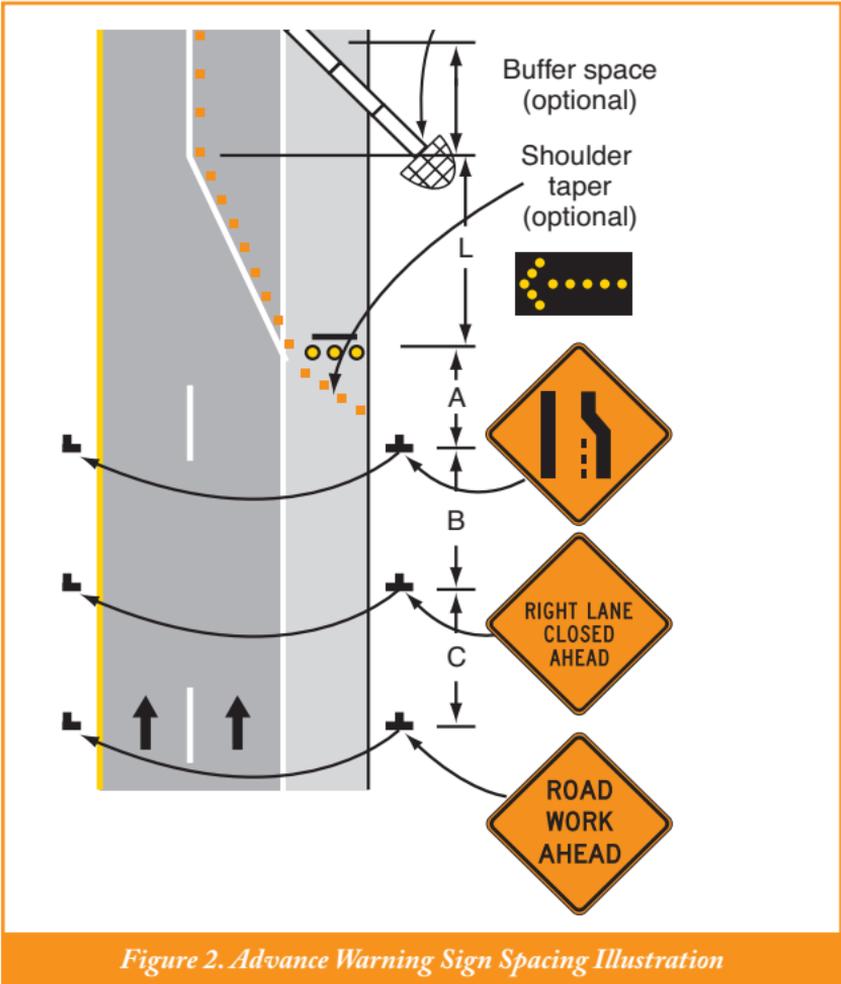


Table 1. Advance Warning Sign Spacing Distances

Road Type	A	B	C
Urban (low speed)	100'	100'	100'
Urban (high speed)	350'	350'	350'
Rural	500'	500'	500'
Freeways and Expressways	1000'	1500'	2640'

While agencies may determine the break point between low speed urban and high speed urban, a general rule of thumb can be used. Typically, low speed is less than 45 mph and high speed is 45mph or greater when determining sign spacing distances.

TTCZ Considerations

After the traffic control devices are in place, inspection and observation of the work zone needs to take place and adjustments need to be made if there are safety or drivability issues.

Some observations that would be of concern include:

- Erratic motorist movements.
- Sudden stops.
- Squealing tires.
- Other indicators that motorists are having difficulty in maneuvering through the work zone.

When these types of behaviors are observed, actions need to be taken to ensure the safety of the traveling public and the workers working in the work zone.

- Notify the supervisor of a potential problem.
- Suspend work due to safety concerns.

Some factors that could contribute to erratic motorist behavior and maneuvers include:

- Hills.
- Curves.
- Obstructions.
- Color contrast.
- Bad weather.
- Visibility issues and/or glare.
- Poor pavement markings.



- Eradicated lane lines that look like lane markings in wet weather.
- Poor signing.
- Driveways.
- Turning movements.
- Construction vehicles entering/exiting.
- Temporary roadway geometrics (lane widths, taper lengths, device placement).

Possible solutions:

- Extend the buffer area beyond the area of concern.
- Move the transition area in advance of the curve.
- Provide additional advance warning of the situation.

Major changes to an approved Traffic Control Plan must be authorized and approved by appropriate personnel. When in doubt, ask a supervisor.

Buffer Space

Work zones are designed to compensate for driver error. One such design component is the buffer space – an area that protects workers by allowing errant motorists to slow down and stop prior to the work space. This area also protects road users from hazards in the work space, such as work vehicles and equipment. The MUTCD states that the buffer space is optional and may be used. The following table provides longitudinal buffer distances based on the operating speed of a facility (not necessarily the posted speed). Lateral buffer distances should be based on engineering judgment.

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

Short-Duration Operations

As compared to stationary operations, mobile and short-duration operations are activities that occupy a location for up to one hour. These operations might involve different treatments. Keep in mind that:

- Safety in short-duration operations should not be compromised by using fewer devices simply because the operation will frequently change its location.
- Appropriately colored or marked vehicles with flashing or rotating lights may be used in place of signs and channelizing devices for short-duration operations (these vehicles may be augmented with signs or arrow panels).
- During short-duration work, it often takes longer to set up and remove the TTCZ than to perform the work, and workers face multiple hazards during the process of setting up and taking down the TTCZ.
- Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed.
- Considering these factors, simplified traffic control procedures may be warranted for short-duration work.
- A reduction in the number of devices may be offset when a work vehicle displays high-intensity rotating or flashing lights.

Temporary Traffic Control Should Reflect Actual Work Zone Conditions

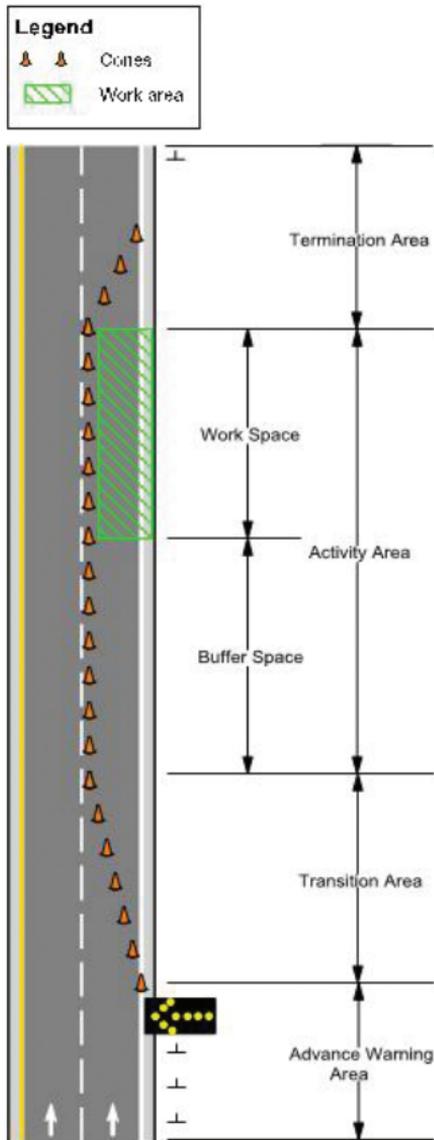
When work is complete or suspended, the MUTCD states that, “All TTC devices shall be removed as soon as practical when they are no longer needed. When work is suspended for short periods of time, TTC devices that are no longer appropriate shall be removed or covered.”

When removed, devices shall be located outside of the clear zone (lateral distance measured from the edge of the travel way). Refer to the AASHTO Roadside Design Guide and/or your State’s standards for typical clear zone distances based on speed.

Steps to Remove Traffic Control Devices In The Work Zone

1. Remove devices from the **Termination Area** against the flow of traffic. Use of a TMA on the lead vehicle or shadow vehicle is recommended, where applicable, during removal.
2. Remove devices from the **Activity Area** against the flow of traffic:
 - a. Make sure **Work Space** is clear and cleaned before removing devices.
 - b. Remove devices from the **Buffer Space**.
3. Remove devices from the **Transition Area** against the flow of traffic.
4. Remove advance warning signs in the **Advance Warning Area** against the flow of traffic. Remove the first advance warning sign last.

Stationary Lane Closure Installation and Removal



Special Consideration for Installation and Removal for Detour Routes

When the traffic control plan requires a detour route, installation and removal procedures are different than for a normal stationary lane closure.

For installation of a detour:

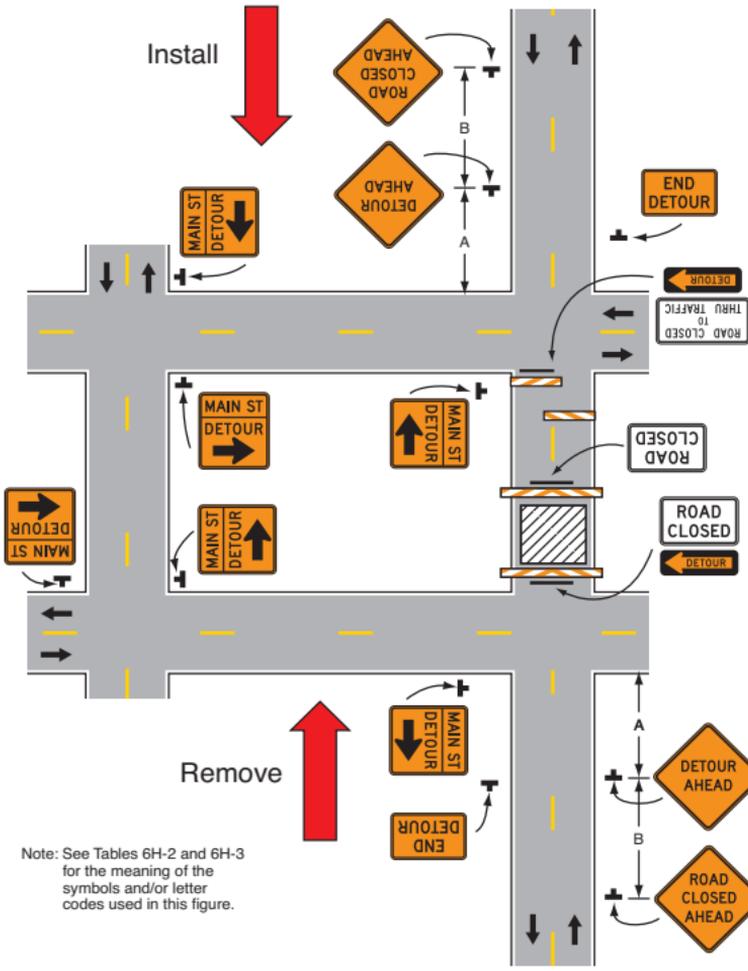
- First install the last sign motorists will see (the sign that guides motorists back to the route they were detoured from).
- Second, install the remaining signs working back toward the beginning of the detour. This procedure allows motorists to detour only after all the signs are in place.

For removal of a detour:

- First remove the sign at the beginning of the detour route.
- Second, remove the other signs with the flow of traffic.

With the appropriate level of staff available, all detour signs may be placed in the field at the same time. Additionally, detour signs can be placed one by one and covered until ready for use.

Detour Installation and Removal



Note: Northbound sign installation and removal shown. Reverse for southbound direction.

How To Approximate Distances in the Field

To approximate the distance in the field, some methods are available:

- **Roller Tape:** Use a roller tape device for shorter distances (up to $\frac{1}{2}$ mile).
- **Vehicle Odometer:** Use the vehicle odometer to measure longer distances such as longer sign spacing distances in the advance warning area.
- **Intermediate Reference Location Signs:** Approximate distances using Intermediate Reference Location Signs (typically located at one-tenth of a mile spacing).
- **Survey Marking:** On construction projects, station markings or other survey markings may be used if visible and distances are available.
- **Skip-Line Method:** Upon arrival at the scene, determine the pattern of the skip lines.
 - ◆ Most skip lines are on a “10-30” pattern.
 - ◆ This means that the painted lines are 10 feet long and the gap between them is 30 feet long.
 - ◆ For this example, there are 40 feet from the beginning of one skip line to the beginning of the next skip line.
- **Pacing Method:** In advance, determine the length of your stride and how many paces it would take you to cover the distances needed.

Safety Tips

- Stay Alert.
- Do not turn your back on traffic.
- Have a bail-out plan in case of an errant vehicle.
- Protect yourself — get out of the way of errant vehicles.
- Warn other workers of errant vehicles.
- Use a spotter.
- Use a TMA during installation and removal.
- Always wear High Visibility Safety Apparel when working in or near a roadway. (See the High-Visibility Safety Apparel In Highway Work Zones brochure).
- Install as many of the traffic control devices as possible from the shoulder.
- Ensure that proper lighting is available for nighttime installation and removal of temporary traffic control devices.
- Law enforcement personnel may be used during installation and removal activities to help deter speeding and provide enhanced visibility for the operation. Enforcement personnel should be in safe locations on the shoulder or off the roadway.

Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the Federal Highway Administration.

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