Work Zone Traffic Control Guidelines for Maintenance Operations

M 54-44.08

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While this manual provides interpretive guidance, it does not change the intent of Part 6 of the Manual on Uniform Traffic Control Devices (MUTCD). This manual is a supplement to the MUTCD and applies to temporary traffic control operations of 3 days or less for maintenance, utilities, and developers.

Effective traffic control is essential, not only for the safety of the traveling public, but also for WSDOT employees whose jobs often require them to be near high-speed motor vehicle traffic. The traffic control guidelines in this manual are intended to reduce field personnel’s exposure to the risks of proximity to traffic and offer road users consistent and positive guidance through work zone areas. Safety of crews and the driving public must be an integral part of WSDOT field operations.

We emphasize that these are guidelines and not absolute standards. The information provided in this manual is intended to provide consistent statewide guidance in how to address common work operations and does not address all possible work zone operations. Modifications to the plans to fit specific work operations and locations are encouraged. Some portions of the guidance such as the bold text along with charts shown on the plan sheets refer to WSDOT policy and should be considered requirements. If these requirements cannot be physically implemented, then MUTCD standards shall apply as the minimum. The traffic control plans in this manual are to be used along with sound judgment. Proper planning, a good safety conscious attitude and full participation from the persons involved in the work zone are all prerequisites to good traffic control. Aspects of the roadway environment such as weather, time of day, motor vehicle traffic volumes and speed, presence and composition of other multimodal traffic, roadway geometry, roadside conditions, and your inventory of traffic control devices should all be considered when implementing the guidelines of this manual.

If you have any questions or needs not addressed here, please consult your Regional Traffic Office staff for assistance.

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Traffic Operations

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Maintenance Engineer
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1-1  Introduction

The primary function of work zone traffic control is to allow all modes of traffic, including motor vehicles, bicyclists, and pedestrians to move safely and easily through or around work areas while still allowing for safe and efficient work operations to be conducted. Effective temporary traffic control enhances traffic safety and efficiency. All modes of traffic need and expect to be guided in a clear and positive manner while approaching and navigating temporary traffic control zones.

The Traffic Control Plans (TCPs) contained in these guidelines are intended to address common highway maintenance work operations. They are typical in nature and not drawn to scale so minor modifications may be needed to accommodate site conditions and specific work operations. An alternate or site-specific plan should be developed if substantial revisions are necessary. In many instances, an appropriate TCP is achieved by combining features from various plans to fit the operation and specific roadway features such as intersections or driveways. Consult the Region Traffic Office staff for assistance.

The Federal Highway Administration's (FHWA) Manual on Uniform Traffic Control Devices (MUTCD) is adopted by the Washington State Department of Transportation (WSDOT) as the legal standard. Part 6 of the manual provides standards and guidance for temporary traffic control. The typical applications (TAs) shown in Part 6 may also be used but it is important to remember that they are the minimum national standards and may not meet specific Washington State requirements. Contact the Region Traffic Engineer for approval prior to using these applications.

The plans in this manual are not intended for WSDOT contract use. Typical traffic control plans for contract use can be found at WSDOT - Plan Sheet Library.
1-2 Considerations

1. Always consider the use of positive protection whenever practical. During short-term operations, a truck-mounted attenuator (TMA) should be used when available. Long-term projects (three days or longer) may require the use of temporary concrete barrier.

2. Prior to beginning work, consider all aspects of the work and location, including, but not limited to, work duration, work area access, motor vehicle traffic speed and volume, driveways and intersections, presence of all other travel modes, when deciding on a traffic control plan.

3. After temporary traffic control devices have been placed per the plan, drive through the installation to determine the effectiveness and make adjustments if appropriate. Additional reviews throughout the work shift are recommended to ensure that traffic control devices remain in place. If devices will be in place over night, they should be reviewed for nighttime effectiveness.

4. Whenever the temporary traffic control zone extends more than 2 miles from the first advance warning sign, the devices need to be moved forward to maintain appropriate advance warning to drivers, especially in urban areas with multiple interchange ramps.

5. Contact the region traffic management center (TMC) prior to starting work and after completion when appropriate, based on region polices to notify them of your work operation status. Also coordinate with the region communications manager for public notification and to be included in the weekly region construction activity report.

6. Plan ahead for personnel, equipment, and materials that will be needed for the traffic control installation and consider opportunities to combine multiple work operations within a single traffic control installation. This could include region wide and statewide crews that may have a need to work within your maintenance area.

7. The Washington State Patrol (WSP) and WSDOT have reimbursement agreement for WSP work zone enforcement and participation in traffic control operations such as rolling slowdowns. Coordinate early with Region Traffic Office staff to complete a task order for WSP use. Refer to Traffic Manual M 51-02 Chapter 5, for more information.

8. Credibility with the traveling public is established through the proper and consistent use of temporary traffic control devices. Poor work zone credibility has a direct, negative impact on work zone safety by causing driver confusion, frustration, and disrespect.

9. Temporary pavement markings must be installed prior to opening the roadway to traffic after paving or chip seal operations. See special detail sheet TCD 8 in Chapter 5 for marking details.

10. Traffic delays must be anticipated and addressed with appropriate work hours to reduce impacts. Region Traffic Offices may have developed hourly lane closure charts or will provide allowable closure hours. Traffic should not be allowed to back up past the advance warning signs. Sign locations may need to be adjusted or additional signs added to the sequence to address backups. Use of advance portable changeable message signs (PCMS) and highway advisory radio (HAR) are recommended.
1-3 Work Duration

The categories of work duration and their time at a location shall be:

1. Long-term stationary is work that occupies a location more than three days.
2. Intermediate-term stationary is work that occupies a location more than one daylight period up to three days, or nighttime work lasting more than one hour.
3. Short-term stationary is daytime work that occupies a location for more than one hour within a single daylight period.
4. Short duration is work that occupies a location up to 1 hour.
5. Very Short Duration is work that will only take a few seconds or minutes to perform.
6. Mobile is work that moves intermittently or continuously.

1-4 Personal Attributes

Awareness – Routinely working near traffic can lead to workers becoming complacent to the danger around them. Therefore, it is necessary to continually remind ourselves and those around us of the dangers to which everyone is exposed. Pre-activity Safety Plans and daily “tail-gate” meetings are required prior to beginning any work operation to ensure everyone is aware of the task to be performed and their respective duties.

Alertness – There is no place in the work zone for a daydreamer or distracter. Each individual must stay constantly alert and attentive for their own protection and the entire crew.

Attitude – A safety-conscious attitude on the part of each crewmember will contribute greatly to the overall safety for all.

Responsibility – It’s everyone’s responsibility to understand and comply with all safety standards and practices.

“All WSDOT employees are directed to make the safety of workers and the traveling public our highest priority during roadway design, construction, maintenance, and related activities” (excerpt from Executive Order E 1001.01).

1-5 Personal Protective Wear

Refer to the Safety Procedures and Guidelines Manual M 75-01 for guidance and requirement on personal protective equipment and a pre-activity safety plan (PSP).

For specific questions regarding personal protective equipment, contact the Region Safety Office.
1-6  Traffic Control Devices and Equipment

1-6.1  Crashworthy Requirements

Portable sign stands with signs, type 1, 2, and 3 traffic barricades, and Truck Mounted
Attenuators must all be compliant with the federal NCHRP 350 or MASH crash test
requirements. Sign stands must have an identifying label on the stand indicating it meets
-crashworthy requirements.

1-6.2  Condition of devices

All personal protective equipment and traffic control devices must be kept clean and in
an “acceptable or marginal” condition as defined in the “Quality Guidelines for Temporary
Traffic Control Devices”. A sign or traffic control device determined to be “not acceptable”
shall be replaced as soon as possible. Limited copies of the Quality Guidelines book may
be obtained from the HQ Traffic Office or ordered through the American Traffic Safety
Services Association (www.atssa.com).

1-6.3  Signs

All standard temporary warning signs are required to be 48 × 48 inch diamond shape
with black letters or symbols on a fluorescent orange reflective background. Refer to
the Sign Fabrication Manual M 55-05 for standard sign legends. Roll-up signs are allowed
for WSDOT maintenance work and short duration utility and developer work by permit.
WSDOT contract work requires rigid aluminum signs. Use of double-faced (back-to-back)
signs or signs made of plywood substrate are not crashworthy and are not allowed.

Sign supports must be maintained in good condition. When it is necessary to add weight
for stability, sand bags or other ballast may be used, but the top of the ballast must not be
more than 4 inches above the roadway surface and must not interfere with the breakaway
features of the device. Minimum sign mounting height for temporary warning signs is
1 foot above the ground. When a sign is located behind traffic safety drums or temporary
barrier, use sign supports that will raise the mounting height to 5 feet to provide
additional visibility. Do not block pedestrian and bicyclists access with sign placement.

For the purpose of temporary sign installation, the median barrier is considered to be
part of the shoulder and its measurement shall be used to determine the total width of
the shoulder. Smaller sign sizes may be used in the median when the median width is
between 6.5 feet and 8 feet to provide left sign assemblies on multilane roadways.

Signs that will be in place at one location continuously for longer than three days must
be post mounted.

Some roadway impacts might require the use of special, modified, or regulatory signs.
Contact Regional Traffic Office for assistance with special signs.
Additional warning signs may need to be added to a plan to address specific work zone conditions when they exist. These signs may be needed during non-working hours if the conditions exist between shifts.

Examples:

- “Motorcycles Use Extreme Caution” followed by, “Abrupt Lane Edge”, “Loose Gravel”, “Grooved Pavement”, “Bump”, or “Steel Plates” when conditions apply.
- Traffic Revision Ahead
- Road Narrows
- Rough Road
- No Shoulder
- Water Over Roadway

*Refer to Section 1-8.3 for additional information on motorcycle warning signs.

1-6.4 **Vehicles**

**Work Vehicle** – All work vehicles within the work zone must be equipped with an approved flashing warning beacon. Consideration must be given to the location of workers in relation to the work vehicles. Worker safety can be jeopardized if the motorists’ attention is focused on the work vehicle and beacon. Additional information on vehicle lighting can be found in the *Transportation Equipment Fund Rules* M 3015, Chapter 5 Vehicle and Equipment Warning Light Systems.

**Protective Vehicle** – Is a vehicle strategically placed in advance of the work area with a proper roll-ahead distance to protect workers if impacted. A TMA is always recommended and may be required in some operations. Refer to the TCPs for specific information on roll ahead distances and TMA requirements.

**Shadow Vehicle** – Is a vehicle used in a mobile operation to provide advance warning information motorists and to operate as a protective vehicle for the work vehicle. These vehicles often include a truck mounted Portable Changeable Message Sign/Arrow Board to provide temporary traffic control information to the motorists. Consider turning the flashing beacon off to reduce any confusion with arrow board display.

1-6.5 **Portable Changeable Message Signs (PCMS)**

- Are a supplement to required static signs and shall *not* be used to replace required signs.
- Shall meet the minimum visibility and legibility standards established in the *MUTCD* 6F.60.
- A message cycle should consist of no more than two message displays at 2.0 seconds each. Refer to *MUTCD* Table 1A-2 for a list of acceptable message abbreviations. Drivers should be able to read the message cycle twice at the posted speed.
- Consider use of a truck mounted PCMS for protective and shadow vehicles to allow for maximum flexibility.
When locating a PCMS in the field:

- **Bottom of sign panel shall be a minimum of 7 feet above roadway.**
- Except when the PCMS trailer is being moved, it shall be detached from the towing vehicle. **Towing trailer devices with the display active as a mobile operation is not allowed.**
- Try to place behind guardrail or barrier.
- Select widened shoulder areas to allow a minimum 4-foot lateral clearance from the edge of the sign panel to the edge of the travelled lane.
- Place a taper of at least three channelizing devices in advance of the PCMS (drums or cones as appropriate).
- Consider the other signing in the area and try to space at least 500 feet from other signs (800 feet is preferred).
- Avoid locations where drivers’ attention is focused on decision points like exits and on ramps. Do not place within gore areas and try to place 1,000 feet or more beyond an exit.
- Avoid placing in areas such as the outside of a curve where it is in the natural path of an errant driver.
- **A PCMS is to be removed when it's not displaying any messages.** (they may remain for short durations with no display for staging purposes or when an intermittent message is needed during work operations)

If the PCMS cannot be placed with the guidelines above, then evaluate the added value versus the risk. Use of permanent message signs, when present, may be considered for high impact operations.

### 1-6.6 Arrow Boards

- Arrow boards shall meet the minimum size, visibility, legibility distance, number of elements, and other specifications as shown in the MUTCD Section 6F.61.
- **Required on multi-lane roads for all lane closure tapers, except during an emergency. A separate arrow board is required for each lane being closed.**
- Arrow boards shall not be used on a two-lane, two-way roadway.
- Arrow boards shall not be used to laterally shift traffic.
- Arrow boards shall only be used in the caution mode when used for shoulder closures.
- **Only the four-corner flash mode shall be used to indicate caution. The Double Diamond or flat bar caution modes are not allowed.**
- The arrow board shall be located behind channelizing devices (unless used in mobile operations where it is truck mounted).
- An arrow display mounted on a shadow (early warning) vehicle is allowed on mobile lane closure operations.
• Type “C” arrow boards are required for high-speed, stationary lane closures. Type “B” arrow boards are allowed for maintenance and mobile lane closure operations. (See MUTCD Section 6F.61 for additional information on arrow boards.)

• Except when the arrow trailer is being moved, it shall be detached from the towing vehicle. **Towing trailer devices with the display active as a mobile operation is not allowed.**

### 1-6.7 Channelizing Devices

Traffic safety cones are the most common devices used to separate and guide traffic in a work zone. The minimum cone size is 18 inches tall. **For speeds of 45 mph or higher, or during nighttime operations, cones must be a minimum of 28 inches tall, and have retro-reflective bands.** 36-inch cones are also available and are a good option for high-speed roadways.

Tall Channelizing devices are a minimum of 42 inches tall, using a tapered cone type shape and are also a good option for use on high-speed roadways in lieu of 28-inch cones due to their greater visibility.

Tubular markers having a uniform diameter and at any height, should only be used where space restrictions do not allow for other more dominate devices. A common use for tubular markers is to divide opposing traffic lanes or divide open lanes in the same direction on low-speed roads.

Traffic safety drums are 36 inches tall and are the most dominant and preferred device for high-speed high-volume highways because they have the greatest visibility.

Vertical flat panel devices and devices with directional stripe patterns are not allowed due to frequency of placement errors.

**Traffic Safety Drums, Tall Channelization Devices or 36-inch cones are required for lane closure tapers on multi-lane highways with posted speeds of 45 mph or greater. If Tall Channelization Devices or 36-inch cones are used, half the maximum spacing is required to increase the taper visibility. Region Traffic Engineer approval is required to use 28-inch cones for this condition.**

Maximum device spacing requirements are shown on the TCPs.
1-6.8 *Barricades*

Generally used for road or ramp closures along with other channelizing devices and appropriate signing. Barricades used in work zone applications are portable devices with three primary types:

1. **Type 1 Barricade** – Used on lower speed roads and streets to mark a specific hazard or can be used for sidewalk closures as appropriate.

2. **Type 2 Barricade** – Used on higher speed roadways and has more reflective area for nighttime use to mark a specific hazard.

3. **Type 3 Barricade** – Used for road closures.

Signs mounted on Type 3 Barricades shall be per the manufacturers recommendations or per Standard Plan K-80.20.

1-6.9 *Positive Protection Devices*

Positive protection devices provide a physical separation between traffic and the work area. These devices are not considered channelizing devices because their primary function is to keep errant vehicles out of the work area.

**Temporary Barrier**

Temporary Barrier is most commonly made of concrete, but steel barriers are also becoming more available, some with castors allowing greater portability and barrier openings for work area access. Temporary barriers are recommended for long-term, stationary work zones.

Consider the following for use of temporary barriers:

- Work areas where there is a no escape route for workers such as internal lane work, work zones in tunnels, on bridges, next to retaining walls, etc.
- When workers must be within a lane width of high speed and high volume of traffic.
- When traffic needs to be protected from equipment, materials, drop-offs or other conditions that must remain until the work is completed.
- The approach ends of temporary barriers must be adequately protected. If the barrier end cannot be tapered outside clear zone, placed behind guardrail, or buried in the back slope then the end must be fitted with a temporary impact attenuator.

**Truck Mounted Attenuators**

A truck-mounted attenuator (TMA) is a portable impact attenuator attached to the rear of a host vehicle with a weight range in accordance to the manufacture's recommendations.

The TMA is used as a shield to prevent errant vehicles from entering the work area. During use, the attenuator shall be in the full down and locked position. For stationary operation, the parking brake shall be set, and the tires aligned straight as per manufacturer’s direction. A roll ahead distance is required between the TMA and the work area based on the host vehicles weight and the traffic speed.
Considerations for the use of TMAs:

- TMA use is always recommended but may be required on freeway or high-speed high-volume highway work areas.
- Operations requiring personnel in the work zone on foot or lift-bucket truck operations, a TMAs should be strongly considered.
- When placing or removing devices from a road warrior vehicle, a separate TMA shall be used to protect the road warrior. (See Appendix 3)
- See the plans and details for TMA placement and roll ahead distance requirements.

1-6.10 **Warning Lights**

Warning lights, if used are either flashing (type A or B) when mounted to barricades/sign installations or, steady burn (Types C, or D) when mounted on channelizing devices. **Attach warning lights per the manufacturer's recommendations to be crashworthy.** See the MUTCD Section 6F.83 for additional information.

1-6.11 **Flares**

All work vehicles should carry a supply of flares. Use flares only to alert drivers to emergencies. Emergencies are defined as unforeseen occurrence endangering life, limb, or property. Use caution at incident sites where flammable materials, such as fuel spills, are suspected. Consider carrying electronic flares or orange/red-glow sticks for use instead of incendiary flares where flammable materials are suspected. Electronic flares or light sticks should be removed when the incident has terminated.

1-6.12 **Portable Signal Systems**

Portable traffic control signals are trailer mounted traffic signals used in work zones to control traffic instead of using a flagger. The maximum distance between signal heads is 1,500 feet to minimize wait time and clearance interval. These versatile, portable units allow for alternative power sources such as solar power, generator, and deep cycle marine batteries in addition to AC power. Portable signals are typically used in work zones to control traffic such as temporary one-way operations along a two-lane, two-way highway where one lane is closed, and alternating traffic movements are necessary. Several regions own portable signal systems, check with your region traffic office and signal superintendent if you have a work operation that would benefit from using a portable signal. **TCP 4** is as an example for creating a site-specific plan. Refer to MUTCD Figure 6H-12 for additional information.
1-6.13 **Automated Flagger Assistance Device (AFAD)**

An AFAD is used instead of a paddle to control the movements of traffic and operated remotely by a flagger located off the roadway and away from traffic increasing flagger safety. When sight distance to the flagging station and/or flagger escape routes will be limited, consider using and AFAD. A pilot car operation is still recommended for longer work areas. Contact the Region Traffic Office for specific guidance and advice on the use of these systems. See TCP 3. Additional information is available in the MUTCD Section 6E.

1-6.14 **Portable Highway Advisory Radio (HAR)**

A portable trailer mounted roadside radio broadcast system that can provide detailed work zone traffic and traveler related information via AM radio. Many regions own this equipment and may be available for use to supplement temporary traffic control installations. Contact the Region Traffic Office or Region Signal Superintendent for specific guidance, availability, and advice on the use of these systems.

1-7 **Flagging**

Refer to WAC 296-155-305 for specific flagging requirements.

- Flagging should be employed only when all other methods of traffic control are inadequate to direct, or control, traffic.
- A TCP showing flagger locations, signs and devices is required for any flagging operation no matter the duration.
- Minimum standard flagging paddle size allowed is 18 inches. It is recommended that a 24-inch paddle be used to improve visibility and for all high-speed operations.
- The use of a flashing stop/slow paddle is allowed instead of a standard paddle. Follow the guidance shown in the MUTCD Section 6E.03 for additional information.
- In a mobile operation when the flagger is moving with the operation, all signs associated with the flagger shall be moved ahead whenever work advances to more than 2 miles from the first advance warning signs. Also, a flagger ahead sign must be within 1,500 feet of the flagger and the flagger station must be able to be seen from the sign. If terrain does not allow a motorist to see the flagger from the “flagger ahead sign”, the distance between the sign and the flagger must be shortened to allow visual contact. The spacing shall not be less than the required distance base on the highway speed.
- During hours of darkness, flagger stations shall be illuminated by using a portable light plant or balloon type lights. Mounting height and aim either parallel or perpendicular to the roadway may require adjustment to minimize glare to the drivers. The flagger should be visible and discernable as a flagger from a distance of 1,000 feet.
• Pilot car use is appropriate for long work areas to help maintain traffic speeds and to guide traffic through the work areas. Pilot car operators shall be certified flaggers able to trade off duties with other flaggers. During the pre-activity meeting, discuss any special instructions to ensure everyone understands expectations. Refer to TCP 2 for a pilot car operation.

• When flagging at intersections, a best practice to give flaggers better control of traffic movements, is to reduce motor vehicle traffic approaching the intersection to a single lane whenever possible. This may require lane closures and restricting access to turn pockets with channelization devices (remember to address bicyclists access). Flaggers will also need to control pedestrian crossing movements. Traffic signal must be either turned off or set to all red “flash” mode. At no time shall traffic be flagged with an active signal in full operation. Contact region signal superintendent for assistance with signal operation.

• The placement of a single flagger at the center of an intersection to control traffic is not allowed as per WAC 468-95-302. The only person allowed to legally control traffic from the center of an intersection alone is a uniformed police officer. No matter who is performing the intersection flagging, the appropriate advance warning signing is required to be in place.

• A four-sign sequence is required for all flagging on roadways with posted speeds of 45 mph or higher. The “one lane road ahead” sign may need to be replaced with a more appropriate sign if flaggers are used for short traffic stops for truck crossing, tree falling, or other work and traffic will not be alternated in a single lane. Possible signs may be:
  - Truck crossing
  - Road machinery
  - Utility work
  - Survey crew
  - Blasting
  - Worker symbol sign or simply a sign saying Workers (this sign could be a very generic yet appropriate solution in many cases)

If the above signs are not available or appropriate for the operation, an acceptable alternative would be to repeat the “Flagger Ahead” symbol sign or the “Be Prepared to Stop” sign. Again, the preferred method is to use the sign that most appropriately describes the roadway condition or work operation.
1-8 Pedestrians, Bicyclists, and Other Roadway Users

Give consideration to pedestrian and bicycle traffic where appropriate. Provide an alternate route when existing facilities must be temporarily interrupted due to work operations. Alternative routes need to be clearly delineated and separated from the work activities. Refer to MUTCD Chapter 6D for additional requirements and TCD 9 of this manual for a typical plan for pedestrian traffic control.

1-8.1 Pedestrians

Existing pedestrian facilities that are accessible to pedestrians with disabilities must remain accessible through the work zone to the maximum extent feasible.

The latest details on accessibility guidelines can be found at: www.access-board.gov/prowag for more details consider the following when addressing pedestrian issues within and around work zones:

• Pedestrian accessibility through or around the work area must be accounted for prior to starting work. If temporary pedestrian ramps are necessary, see the Work Zone Typical Traffic Control Plan Library.

• Pedestrians should not be led into conflicts with work vehicles and equipment, or with vehicles moving through or around the work site.

• Pedestrians should be provided with an accessible, convenient path that replicates as nearly as practical the characteristics of the existing sidewalks or a footpath.

• If signs or other devices are place in a pedestrians pathway, a minimum 4-foot width must be maintained.

• For sidewalk closures, advance closure direction signs are required at the nearest upstream crossing to minimize pedestrian’s need to retrace their steps.

• Escorting or shuttling pedestrian and/or bicyclists through the work zone is an acceptable option to providing a alternate route.

1-8.2 Bicyclists

• Bicycles have a legal right of access to most highway facilities and temporary traffic control provisions are necessary for safe bicycle travel through the work zone.

• Provide for and sign an appropriate alternate route when activities close a designated (signed) bicycle path or shoulder bikeway. Where horizontal separation for bicycles and pedestrians existed prior to work, give consideration to separating during work.

• When laying out alternative bicycle paths, make sure no overhead obstructions present a direct hazard to normal bicycle operation.

• Riding surfaces are important for safe bicycle operation. Loose gravel, uneven surfaces, milled pavement, and various asphaltic tack coats endanger the bicyclist. Consider the condition of the surface the bicyclist will be required to use.

• Bicyclists may be combined with motorist traffic when the speed limit is 40 MPH or less.
1-8.3 **Motorcyclists**

The driving or roadway surface is also important for motorcyclists safety. The same surfaces that are a problem for bicyclists are also difficult for motorcyclists. Stability at high speed is a far greater concern for motorcycle operations than cars on grooved pavement, loose gravel, milled asphalt, and abrupt edge tapers from existing pavement down to milled surfaces. Signing to warn motorcyclists of these conditions in a work zone is required by [RCW 47.36.200](https://code.wa.gov/RCW/47.36.200) and [WAC 468-95-305](https://code.wa.gov/WAC/468-95-305). See TCD 2 for a typical signing layout example.

1-8.4 **Schools**

Work zone operations in the vicinity of schools require consideration to ensure that conflicts are kept to a minimum. Issues that should be considered are:

- Student path to and from the school.
- Parent drop off and pickup access.
- Bus movements for loading and unloading students.
- Coordination with crossing guards.
- Avoiding the beginning and end of school hours to minimize adverse impacts.

1-9 **Additional Work Zone Considerations**

1-9.1 **Work Zone Speed Limits**

Roadway surface issues such as loose gravel from chip seal operations, temporary width restrictions or lane shifts, application of a temporary traffic signal are some examples of when a speed limit may need to be reduced. Any proposed regulatory reductions or advisory speed limits require approval through the region traffic engineer. See the [Traffic Manual](https://wsha.wa.gov/traffic-manual/) Chapter 5 for the approval process. Public notification of a regulatory speed limit reduction is required per [RCW 47.48.020](https://code.wa.gov/RCW/47.48.020).

Speed reduction guidelines and requests are outlined in [RCW 47.48.020](https://code.wa.gov/RCW/47.48.020), [Executive Order E 1060](https://wsha.wa.gov/executive-orders/), and chapter 5 of the [Traffic Manual](https://wsha.wa.gov/traffic-manual/) M 51-02. A request to reduce the speed limit in a work zones must be submitted to the Region Traffic Office for approval.
1-9.2  **Buffer Space**

Buffer space is a lateral and/or longitudinal area that separates traffic flow from the work space providing some recovery space for an errant vehicle.

- Lateral buffer is the space between an open lane of traffic and the adjacent work area, temporary barrier, work vehicle, protective vehicle, shadow vehicle or drop-off. A minimum of 2-foot lateral buffer space or more may be recommended.
- Longitudinal buffer is the space from the end of the taper to the protective vehicle.

Channelization devices used to close a lane or shoulder should not encroach into adjacent open lanes. If encroachment is necessary, closing the lane is recommended to provide lateral buffer space to the work zone unless a single open lane is shifted onto the paved shoulder.

In the case of short-term lane closure operations, the adjacent lane may need to be closed or traffic may need to be temporarily shifted onto a shoulder to maintain a lateral buffer space.

1-9.3  **Lane Closure Setup/Takedown**

Operations to set up and take down traffic control devices often equate to the times when crews are at their greatest exposure. Due to the multiple variations of crew size, available equipment, and location, no one procedure can fit all situations. To provide consistency and guidance on how to best perform the operation, the following steps have been provided. See Appendix 3 for lane closure operations using Road Warrior vehicles.

Prior to the beginning of any operation and before any crewmember is exposed to live traffic, the crew will discuss the daily pre-activity safety plan relative to the planned activity.

Within the pre-activity safety plan, discussion topics prior to implementation may include but not limited to:

- Communication/signaling techniques (e.g. verbal, hand, voice actuated headset) between cone handler and truck operator need to be established.
- Clear instructions detailing channelizing device placement and traffic control plans.
- Driver and cone handler work from safest locations on the road and in, on and around deployment vehicle.
- Utilization of truck-mounted attenuators may be necessary to protect crewmembers while exposed to traffic.

The traffic control plan being implemented for the work operation will be discussed and any modifications to the plan will be noted by the supervisor with the final plan being maintained onsite during work the operation.
1-9.4 **Survey Work Zones**

Survey crews are required to follow the guidance and plans shown in this manual to accommodate their work area needs. For example, survey work along the centerline of a two-lane two-way road, will require a flagging operation as shown on TCP 1. TCPs more specific to survey operations may be considered. If specific plans are necessary or additional guidance is needed, contact the Region Traffic Office for assistance.

1-9.5 **Public Information**

Accurate and timely reporting of work zone information to the public is an important element in temporary traffic control. Advance notice of closures and restrictions, web page information and the use of media can greatly improve the public's perception and acceptance of the necessary impacts caused by the work operation. Contact the Region Public Information Office for assistance.

Issues to consider are:

- Emergency services coordination so they are aware of the operation and can make adjustments to routes if necessary when responding to emergencies.
- Transit organizations, they may require adjustments to bus stop locations within project limits.
- Schools and local business, special considerations may be necessary for them to maintain access to their sites.

1-9.6 **Roundabout Traffic Control**

For work within the roundabout, warning signs are required for each approach leg. If the work operation and all work vehicles are out of the travel lanes and central island apron, a Road Work Ahead sign per approach is all that is required. If any of the road approaches to the roundabout cannot access the intersection due to work operations, then either flagging or possibly a detour is required. If the central island apron will be impacted by the work or equipment, treat it as a shoulder closure for the length of work and consider diverting truck traffic due to large vehicle wheel tracking. For multi-lane roundabouts, if work can be done without closing both travel lanes, flaggers may not be needed. Appropriate signs for lane closure at each entry are required.

**A traffic control plan must be developed for each individual roundabout specific to the location since all roundabouts are unique.** A generic typical plan has been provided as a guide in developing a plan (see TCP 7).
1-9.7 **Road Closures and Detours**

Advance notification of the closure is required for planned work operations. Detours should be clearly signed over their entire length so that drivers are returned to the original highway. If the detour route follows non-state routes, local agency approval is required.

Workers should not assume that because a road closure is in place that danger from vehicles does not exist. Even with a posted road closure, the potential may exist for a vehicle to get past a closure point. It is important for workers to remain vigilant and aware of their surroundings at all times and still use protective vehicles prior to the work area.

When it is necessary to close a road, street, or ramp, submit a request to the Region Traffic Office in advance of the need. Per RCW 47.48.010, the Regional Administrator has the authority to close a road, street, or ramp.

1-9.8 **Special Events**

For any special event (parade, bike event, filming, etc.) affecting a state route, a traffic control plan is required. Event organizers must coordinate with WSDOT to obtain permits and submit a traffic control plan for approval prior to the event. Refer to Traffic Manual M 51-02, Chapter 7, for additional information.

Each region has a person that coordinates special event approvals and should be the lead in the event planning. Contact this person for information on special events in your area.

1-9.9 **Work Over Traffic**

Work above an open lane of traffic is allowed provided that the work can be done by utilizing industry standard safe work practices. Safe work practices must consider the potential risk of falling debris, tools, or equipment onto traffic. Maximum legal load height is 14 feet, with a potential for occasional over-height loads, so vertical clearance to traffic below must be carefully considered if lanes are not closed. Contact Commercial Vehicle Services at least 7 days, when feasible, if vertical clearances are temporarily reduced.

1-9.10 **Short & Very short Duration Work Zone Condition**

Due to the short work time, simplified traffic control set-ups are allowed to reduce worker traffic exposure. The time it takes to set up a full complement of signs and devices could approach or exceed the time required to perform the work.

A **Short duration work zone** is for work activities that may last up to 60 minutes for:

- loading and unloading equipment.
- re-lamping.
- pothole patching or other minor repairs.
- bridge inspection.
- sign replacement, etc...
A **Very short duration work zone** is when activities will only take a few seconds or minutes to:

- remove lost cargo or debris.
- install or remove a work zone device.
- take a survey “shot”
- provide motorist assistance.
- perform quick maintenance or repairs intended as a partial or temporary response to an issue, etc.

In many cases it is necessary and allowable for workers to walk on a roadway shoulder, cross traffic lanes, or momentarily step into a lane to access work locations or to perform work. These actions can only be accomplished if traffic conditions allow it to be done safely.

Normally, specific TCPs are not required for these very short work zones since the typical example TCPs for very short duration work zones can cover a wide variety of applications.

It is required to provide advance warning to traffic approaching very short duration work zones on freeways and high speed multi-lane highways as shown on TCP 26 when working in a live lane with a spotter or using a very short duration lane closure.

When short duration plans are to be used, the “Work Zone Condition” should be determined. This helps establish a practical application level of traffic control devices to use. The plans provide recommendations for conditions A, B & C:

**Condition “A”** Represents the lowest level of exposure:

- Low traffic speeds and volume.
- Minimum levels of traffic control devices to place and remove.

**Condition “B”** Represents a moderate level of exposure:

- Low or high traffic speed with low to moderate volumes.
- Moderated levels of traffic control devices for warning and protection, such as adding a spotter, placing cones or PCMS added to condition “A” devices would be typical considerations.

**Condition “C”** Represents the highest level of exposure:

- High traffic speeds and volume.
- All applicable traffic control and safety devices should be considered, such as PCMS, TMA, and signs.
Highway volumes can be identified by the following observations:

- **low motor vehicle volume**
  - Vehicles approach randomly.
  - Significant gaps in traffic flow.
  - Few vehicles visible at any given time.
  - Random platoons of vehicles.
  - Free flow traffic at the posted speed limit.
  - Safe walking pace conditions to cross a two-lane highway or intersection.
  - Rough estimate of traffic volume is approximately 1 vehicle per lane every 12 seconds.

- **moderate motor vehicle volume**
  - Random gaps in traffic are present.
  - Vehicles are generally present all the time.
  - Traffic is constant but still flows freely.
  - Safe walking pace conditions to cross a two-lane highway or intersection exist but may require waiting for a gap in traffic.
  - Rough estimate of traffic volume is approximately 1 vehicle per lane every 6 seconds.

- **high motor vehicle volume**
  - Minimal gaps in traffic.
  - Constantly present vehicles.
  - Restricted or unstable motor vehicle traffic flow.
  - Reduced traffic speeds, as volume starts to approach road capacity.
  - A safe walking condition to cross a two-lane highway or intersection may not exist.
  - A rough estimate is approximately 1 vehicle per lane every 3 seconds.
1-9.11 **Short & Very short Duration Work Zones Rules and Considerations**

1. Live traffic areas (lanes and intersections) on high speed and high-volume roadways may not be good candidates for short duration work zones. Shoulder or adjacent lane work may be acceptable based on a site assessment and as follows:
   - No unprotected work in interior lanes of multi-lane roads and no “island” work areas are allowed.
   - Lanes of multi-lane roads may only be accessed from the adjacent shoulder (see TCP 25 and TCP 26).
   - Intersections may be accessed following the same manner and consideration should be given to the work areas effect on the intersection signal operations. Flash mode or control measures per TCP 5 or TCP 6 may be required.

2. **A determination of a safe work location must be made.** A basic determination can be made by observing multimodal traffic conditions (traffic type, speed, volume, location, visibility, etc.) and assessing the following conditions:
   - Is the work location out of the multimodal traffic paths?
   - Is there sufficient time for a worker to safely walk (not run) to and return from the work location?
   - Are there other conditions at the location that could affect worker safety?
   - Is there an effective contingency or escape plan?
   - Is there adequate sight distance from the work location to approaching traffic (see TCD 10)?

3. Consider a rolling slowdown operation for those work operations of a very short duration in which traffic control measures would take more time to install than the actual work. Typically, rolling slowdowns are desirable for difficult access work zones, such as center lanes or closing all lanes at once on multi-lane highways.

4. Consider linking several short duration work operations under a stationary lane or shoulder closure with a full complement of signs and devices. Advantages include, reducing exposure of workers to traffic, efficiencies in completing tasks concurrently, and reducing the impacts traffic in the same area.

5. In an emergency, personnel are allowed to take action, using good judgment to minimize risk. Traffic control standards do not strictly apply to emergencies but should be considered. It is important to differentiate between an actual emergency and an emergent condition. An emergency requires immediate response to save lives or prevent serious injury or remove debris using whatever resources are available. An emergent condition requires an expedient yet planned response. Most “call outs” or damage reports fall into the emergent condition category allowing time to plan a reasonable short duration work zone response.
1-10 References for Additional Work Zone Information

WSDOT Design Manual Chapter 1010
WSDOT Construction Manual Chapter 1
WSDOT Maintenance Manual Chapter 2
WSDOT Sign Fabrication Manual
WSDOT Standard Specifications Sections 1-07.8, 1-07.23, 1-10, 8-23 & 9-35
WSDOT Traffic Manual Chapter 5
WSDOT Plan Sheet Library
WSDOT Work Zone Safety website
Manual on Uniform Traffic Control Devices (MUTCD)
Chapter 2  Stationary Work Zones

Stationary work zone operations may include: paving/chip seal, pavement repair, light standard repair, sign installation, and bridge repair. Work operations may move or move from location to location within a stationary work zone.

The following TCPs are typical stationary traffic control setups.

TCP 1  **Typical One-Lane, Two-Way Traffic Control with Flaggers**
For two-lane, two-way roadways with possible intersections

TCP 2  **Typical Pilot Car Operation**
Supplements TCP 1 when additional control of traffic is necessary

TCP 3  **Typical Alternating One-Way Traffic with AFAD**
This plan provides an example of the signing and device placement for a flagging operation utilizing an AFAD. Consider use of an AFAD for any flagging operation to increase safety.

TCP 4  **Typical Alternating One-Way Traffic, Portable Temporary Signal Controlled**
This plan provides example of the traffic control signing and device requirements for a portable signal operation. Assistance from the Region Traffic Office and the Region Signal Superintendent may be necessary for signal timing and specific details on the location of the portable signal system. 1,500 feet maximum between signal heads.

TCP 5  **Typical Intersection Lane Closure – Three-Lane Roadway**
Typical urban location with two lanes and a center turn lane. This plan will most likely need modification or be used as an example in developing a site-specific plan to match actual configurations of lanes and turn pockets.

TCP 6  **Typical Intersection Lane Closure – Five-Lane Roadway**
Typical urban location with two through lanes each direction and a center turn lane. This plan will most likely need modification or be used as an example in developing a site-specific plan to match actual configurations of lanes and turn pockets.

TCP 7  **Typical Roundabout Flagging Operation**
This plan is a basic example for the signing and device placement for work in the vicinity of a roundabout. Each roundabout location is unique, and a site-specific traffic control plan should be developed for the work operation.

TCP 8  **Short Term Traffic Stop with Flaggers**
For two-lane, two-way roadways when short traffic stops are needed

TCP 9  **Typical Shoulder Closure – Low Speed (40 mph or Less)**
<table>
<thead>
<tr>
<th>TCP</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP 10</td>
<td>Typical Shoulder Closure - High Speed (45 mph or higher)</td>
</tr>
<tr>
<td>TCP 11</td>
<td>Typical Single-Lane Closure for Multi-Lane Roadways</td>
</tr>
<tr>
<td>TCP 12</td>
<td>Typical Double-Lane Closure for Multi-Lane Roadways</td>
</tr>
<tr>
<td>TCP 13</td>
<td>Typical Temporary Off-Ramp for Multi-Lane Roadways</td>
</tr>
<tr>
<td></td>
<td>Details an off-ramp connection during a short-term lane closure</td>
</tr>
<tr>
<td>TCP 14</td>
<td>Typical Temporary On-Ramp for Multi-Lane Roadways</td>
</tr>
<tr>
<td></td>
<td>Details an on-ramp add-lane connection during a short-term lane closure</td>
</tr>
<tr>
<td>TCP 15</td>
<td>Typical Temporary On-Ramp for Multi-Lane Roadways</td>
</tr>
<tr>
<td></td>
<td>Details an on-ramp merge connection during a short-term lane closure</td>
</tr>
<tr>
<td>TCP 16</td>
<td>Typical Short-Term Ramp Closures</td>
</tr>
<tr>
<td></td>
<td>This plan details both off-ramp and on-ramp closures at interchanges</td>
</tr>
<tr>
<td>TCP 17</td>
<td>Typical Right Lane Closure with Shift – 5 Lane Roadway</td>
</tr>
<tr>
<td></td>
<td>For an urban setting using the two-way left turn lane for through traffic in</td>
</tr>
<tr>
<td></td>
<td>one direction</td>
</tr>
<tr>
<td>TCP 18</td>
<td>Typical Left Lane and Center Turn Lane Closure – 5 Lane Roadway</td>
</tr>
<tr>
<td></td>
<td>For an urban setting creating an inside lanes work area with through traffic</td>
</tr>
<tr>
<td></td>
<td>maintained in the outside lanes in each direction</td>
</tr>
<tr>
<td>TCP 19</td>
<td>Outside Lane Closures – Five-Lane Roadway</td>
</tr>
<tr>
<td></td>
<td>Typical urban location with two through lanes each direction and a center</td>
</tr>
<tr>
<td></td>
<td>turn lane. This plan may be used when work will require short traffic stops</td>
</tr>
<tr>
<td></td>
<td>for both directions of traffic.</td>
</tr>
<tr>
<td>TCP 20</td>
<td>Typical Lane Shift – Three Lane Roadway</td>
</tr>
<tr>
<td></td>
<td>This plan details maintaining one lane in each direction in truck lane</td>
</tr>
<tr>
<td></td>
<td>sections</td>
</tr>
<tr>
<td>TCP 21</td>
<td>Typical Lane Shift with Two Way Left Turn Lane</td>
</tr>
<tr>
<td></td>
<td>This plan details maintaining one lane in each direction using the TWLTL</td>
</tr>
</tbody>
</table>
NOTES
1. Night work requires additional roadway lighting at flagging stations.
2. Recommend extending channelizing device taper across shoulder, Channelizing devices at flagger stations recommended.
3. Protective Vehicle recommended and may be a work vehicle strategically located to shield the work area.
4. For low-volume roadways with short-duration work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible from both directions may be used.
5. Extend the buffer space to locate the flagger station in advance of a curve, if necessary.
6. Flagger shall provide control and direction for pedestrians.
7. Sign sequence is the same for both directions of travel on the roadway.

TYPICAL ONE-LANE, TWO-WAY TRAFFIC CONTROL WITH FLAGGERS
TCP 1

LEGEND
FLAGS STATION
SIGN LOCATION
CHANNELIZING DEVICES
PROTECTIVE VEHICLE
TCP 2  Typical Pilot Car Operation

NOTES
1. Refer to sheet TCP 1 for additional signing and flagging details not shown.
2. Channeling devices are recommended along embankments to separate traffic from work areas and for protection at all flagging stations.
3. Sign C25-11 is recommended for non-stop sign-controlled approaches and overpasses, and for guardrails greater than 600 mm.
NOTES
1. Each AFAD shall be operated by a flagger from a safe location with visual contact of the traffic.
2. Nightwork requires additional roadway lighting at AFAD stations.
3. Recommend extending channelizing device taper across shoulder.
4. The Protective Vehicle recommended and may be a work vehicle strategically located to shield work area.
5. Sign sequence is the same for both directions of travel on the roadway.
6. Extend the buffer space to locate the flagger station in advance of a curve, if necessary.
7. AFAD location shown is typical for wide shoulder area, actual location may need to be in lane. Placement of AFAD shall be such that the gate arm does not encroach into adjacent lane.
NOTES

1. The maximum recommended distance between portable signals is 1,500 feet to reduce traffic delays. Contact the region signal superintendent for assistance with signal timing.

2. Install no passing stripes if not already in place.

3. Sign sequence is the same for both directions of travel on the roadway.

4. Post mount signs for locations in place longer than 3 days.

5. Temporary lighting is required at stop bars during work operations at night.

6. Protective vehicle recommended; it may be a work vehicle.

7. This plan may need to be adjusted to fit site conditions. Refer to the manual on uniform traffic control devices (mud) part 6.

8. Consider speed limit reduction signing. Contact region traffic office for approval.
Stationary Work Zones Chapter 2

WSDOT Work Zone Traffic Control Guidelines for Maintenance Operations

January 2021

TCP 5

Typical Intersection Lane Closure – Three Lane Roadway

**SIGN SPACING = X (1)**

<table>
<thead>
<tr>
<th>RURAL HIGHWAYS</th>
<th>10+5 MPH</th>
<th>500 ft +-</th>
</tr>
</thead>
<tbody>
<tr>
<td>RURAL ROADS</td>
<td>45-55 MPH</td>
<td>500 ft +-</td>
</tr>
<tr>
<td>RURAL ROADS &amp; URBAN AREAS</td>
<td>35-40 MPH</td>
<td>350 ft +-</td>
</tr>
<tr>
<td>RURAL ROADS &amp; URBAN AREAS</td>
<td>25-30 MPH</td>
<td>200 ft +-</td>
</tr>
<tr>
<td>URBAN STREETS</td>
<td>25 MPH OR LESS</td>
<td>100 ft +-</td>
</tr>
</tbody>
</table>

(1) All spacing may be adjusted to accommodate interections and driveways.
(2) All signs are 42” X 42” BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

**MAXIMUM CHANNELIZATION DEVICE SPACING (feet)**

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPE</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-55</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35-45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>20-25</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

**MINIMUM LANE SHIFT TAPER LENGTH = L/2**

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>10</th>
<th>25</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>L/2 (Taper)</td>
<td>40</td>
<td>80</td>
<td>100</td>
<td>150</td>
<td>200</td>
<td>270</td>
<td>350</td>
</tr>
</tbody>
</table>

**LONGITUDINAL BUFFER SPACE = B**

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>10</th>
<th>25</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (ft)</td>
<td>115</td>
<td>155</td>
<td>200</td>
<td>250</td>
<td>305</td>
<td>360</td>
<td>425</td>
<td>495</td>
<td>570</td>
</tr>
</tbody>
</table>

**PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R**

<table>
<thead>
<tr>
<th>MOST VEHICLE WEIGHT</th>
<th>UP TO 40 MPH</th>
<th>40-55 MPH</th>
<th>60-80 MPH</th>
<th>UP TO 40 MPH</th>
<th>40-55 MPH</th>
<th>60-80 MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>100'</td>
<td>127</td>
<td>172</td>
<td>207</td>
<td>100</td>
<td>172</td>
<td>207</td>
</tr>
</tbody>
</table>

**NOTES**

1. Protective vehicle recommended – may be a work vehicle strategically located to shield work operation.
2. Recommend extending channelizing device taper across shoulder, Channelization devices at flagger station recommended.
3. If existing signal is present, signal shall be set to "red flash mode" or turn off during flagging operations.
4. For speed limit of 10 mph or less use sign W1-3 in lieu of sign W1-4.
5. Maintain a minimum of one access point for each business within work area limit.
6. Consider using PCMS for additional advance warning.
7. Flaggers shall provide control and guidance for pedestrians.

**TYPICAL INTERSECTION LANE CLOSURE - THREE LANE ROADWAY**

TCP 5
TCP 7

Typical Roundabout Flagging Operation

NOTES
1. Night work requires additional roadway lighting at flagging stations.
2. Protective vehicle recommended: may be a work vehicle strategically located to shield work area.
3. This plan should be modified to meet the specific conditions of the location and the work operation.
4. If the work and all work vehicles are off the travel lanes and island apron, a single Road Work Ahead sign per approach is all that is required.
5. Additional signing in center island may be necessary to assist traffic movement through roundabout.

Legend
- Flagging Station
- Sign Location
- Type 3 Baricade
- Channeling Devices 20' spacing max.
- Protective Vehicle - Recommended
- Vehicle Travel Path During a Flagging Phase

Typical Roundabout Flagging Operation TCP 7
Chapter 2 Stationary Work Zones

WSDOT Work Zone Traffic Control Guidelines for Maintenance Operations

January 2021

TCP 8
Typical Traffic Stop with Flaggers

**TYPICAL SHORT TERM TRAFFIC STOP WITH FLAGGERS**

TCP 8

**NOTES**

1. Night work requires additional roadway lighting at flagging stations.
2. Coordinate with Region Traffic office for work hours and stop durations.
3. The roadway in the work area shall have no materials, equipment, or restrictions until both flaggers have stopped traffic, and before flaggers release traffic.
**Stationary Work Zones Chapter 2**

**WSDOT Work Zone Traffic Control Guidelines for Maintenance Operations**

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January 2021

**TCP 9**

**Typical Shoulder Closure - Low Speed (40 MPH or Less)**

**NOTES**

1. Address pedestrian control through or around the work area.

2. When used, device spacing for the downstream taper should be 20’ O.C.

**LEGEND**

- **X**
  - Sign Location
- **□ □ □**
  - Channelizing Devices
- **□ [ ]**
  - Protective Vehicle - Recommended

**TYPICAL SHOULDER CLOSURE - LOW SPEED (40 MPH OR LESS)**

TCP 9
## Typical Shoulder Closure - High Speed (45 MPH or Higher)

**TCP 10**

**NOTES**

1. No encroachment on traveled lane, if encroachment is necessary, lane shall be closed. The 2' lateral buffer is recommended.

2. When used, device spacing for the downstream taper should be 20' O.C.

3. If shoulder is used for traveled lanes at certain times, use full taper and TMA.

4. TMA required for freeways.

**WSDOT Work Zone Traffic Control Guidelines for Maintenance Operations**

**M 54-44.08**

**January 2021**

**SIGN SPACING = X (1)**

<table>
<thead>
<tr>
<th>FREEWAYS &amp; EXPRESSWAYS 50-75 MPH</th>
<th>500 +/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>RURAL HIGHWAYS 50-65 MPH</td>
<td>800 +/-</td>
</tr>
<tr>
<td>RURAL ROADS 45-50 MPH</td>
<td>500 +/-</td>
</tr>
</tbody>
</table>

1) All spacing may be adjusted to accommodate interchange ramps at-grade intersections and driveways.

**MAXIMUM CHANNELIZATION DEVICE SPACING (feet)**

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-75</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35-45</td>
<td>30</td>
<td>80</td>
</tr>
</tbody>
</table>

**SHOULDER CLOSURE TAPER LENGTH = L/3**

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>L/3 (feet)</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

**LONGITUDINAL BUFFER SPACE = B**

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (feet)</td>
<td>360</td>
<td>425</td>
<td>495</td>
<td>570</td>
<td>645</td>
<td>720</td>
<td>800</td>
</tr>
</tbody>
</table>

**STANATORY TRANSPORTABLE ATTENUATOR ROLL AHEAD DISTANCE = R**

<table>
<thead>
<tr>
<th>HOST VEHICLE WEIGHT 45 MPH</th>
<th>45-55 MPH</th>
<th>50+ MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>OVER 0 TO 2000 lbs</td>
<td>12'</td>
<td>12'</td>
</tr>
<tr>
<td>OVER 2001 to 6000 lbs</td>
<td>12'</td>
<td>12'</td>
</tr>
<tr>
<td>OVER 6001 to 20,000 lbs</td>
<td>12'</td>
<td>12'</td>
</tr>
</tbody>
</table>

**LEGEND**

- **N** SIGN LOCATION
- **• • •** CHANNELIZING DEVICES
- **TMA** TYPICAL SHOULDER CLOSURE - HIGH SPEED (45 MPH OR HIGHER)

**TYPICAL SHOULDER CLOSURE - HIGH SPEED (45 MPH OR HIGHER)**

TCP 10
**Typical Double-Lane Closures for Multi-Lane Roadways**

**TCP 12**

**NOTES**

1. A TMA is required for roadway 45 mph or higher. For roads 40 mph or less, if a TMA is not available, a protective vehicle shall be strategically located in the field to shield workers.

2. Traffic safety drums, tall channelization devices, or 36 inch cones required for all lane closure tapers on roadway 45 mph or higher. (Half-spacing required for tall channelization devices and 36 inch cones)

3. Devices should not encroach into adjacent lanes.

4. Use transverse devices in closed lane every 1000 feet when the work operation allows.

5. Downstream taper device spacing should be 20 feet when a taper is used.

6. Coordinate with Region Traffic office for work hour restrictions.

**MINIMUM LANE CLOSURE TAPER LENGTH - L**

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
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<tbody>
<tr>
<td>L (ft)</td>
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<tr>
<td>12 L (ft)</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>140</td>
<td>160</td>
<td>180</td>
<td>200</td>
<td>220</td>
<td>240</td>
<td>260</td>
<td>280</td>
<td>300</td>
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<tr>
<td>6 L (ft)</td>
<td>40</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>120</td>
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<td>160</td>
<td>180</td>
<td>200</td>
<td>220</td>
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<td>260</td>
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<tr>
<td>10 L (ft)</td>
<td>40</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>140</td>
<td>160</td>
<td>180</td>
<td>200</td>
<td>220</td>
<td>240</td>
<td>260</td>
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**LONGITUDINAL BUFFER SPACE = B**

<table>
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<th>45</th>
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<td>STATIONARY TRANSPORTABLE ATTENUATOR ROLL AHEAD DISTANCE = R</td>
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<td>HOST VEHICLE WEIGHT</td>
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<td>9,950 TO 22,000 lbs.</td>
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<td>UP TO 40 MPH</td>
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<td>HOST VEHICLE WEIGHT</td>
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<td>9,950 TO 22,000 lbs.</td>
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<td>60+ MPH</td>
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<tr>
<td>PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R</td>
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<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Min. chan. device spacing**

<table>
<thead>
<tr>
<th>Device, Spacing (feet)</th>
<th>1000 or X</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPH TAPER TANGENT</td>
<td></td>
</tr>
<tr>
<td>50-75</td>
<td>40</td>
</tr>
<tr>
<td>75-95</td>
<td>40</td>
</tr>
<tr>
<td>90-10</td>
<td>20</td>
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</tbody>
</table>

**PCMs**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>RIGHT 2 LANES CLOSED AHEAD</td>
<td>1.5 MILES AHEAD</td>
</tr>
<tr>
<td>2.0 SEC</td>
<td>2.0 SEC</td>
</tr>
</tbody>
</table>

**SIGN SPACING = X (1)**

- FREEWAYS & EXPRESSWAYS: 50-75 MPH, 1500 ft
- RURAL HIGHWAYS: 60-85 MPH, 800 ft
- RURAL ROADS: 45-55 MPH, 500 ft
- RURAL ROADS & URBAN ARTERRIES: 35-60 MPH, 350 ft
- RURAL ROADS & URBAN ARTERRIES: 25-10 MPH, 200 ft
- URBAN STREETS: 25 MPH OR LESS, 100 ft

**LEGEND**

- N: Sign location
- C: Sign location - 9' mounting height recommended
- TMC: Traffic Safety Drums
- TMC: Tall Channelization Devices
- 1/8: Channelization Devices
- D: Arrow Board
- Z: TMA
- P: Portable Changeable Message Sign Recommended

**TYPICAL DOUBLE-LANE CLOSURE FOR MULTI-LANE ROADWAYS**

TCP 12
**WSDOT Work Zone Traffic Control Guidelines for Maintenance Operations**

**Chapter 2 Stationary Work Zones**

| TCP 14 | Typical Temporary On-Ramp for Multi-Lane Roadways |

**Legend**
- **SIGN LOCATION**
- **SIGN Location - 5' Mounting Height Recommended**
- **Traffic Safety Drums / Tall Channelization Devices / 3' Cones**
- **Channelizing Devices**
- **Arrow Board**
- **TMA**
- **PORTABLE CHANGEABLE MESSAGE SIGN RECOMMENDED**

**Typical Temporary On-Ramp for Multi-Lane Roadways**

**NOTES**
1. A TMA is required for roadway 45 mph or higher. For roads 40 mph or less, if a TMA is not available, a protective vehicle shall be strategically located in the field to shield workers.
2. Traffic safety drums, tall channelization devices, or 36 inch cones required for all lane closure tapers on roadway 45 mph or higher. (Half spacing required for tall channelization devices and 36 inch cones)
3. Devices should not encroach into adjacent lanes.
4. Use transverse devices in closed lane every 1000' when the work operation allows.
5. Coordinate with Region Traffic office for work hour restrictions.
6. Close the ramp when the work area location restricts ramp access.
TCP 15

Typical Temporary On-Ramp for Multi-Lane Roadways

**NOTES**

1. A TMA is required for roadway 45 mph or higher. For roads 40 mph or less, if a TMA is not available, a protective vehicle shall be strategically located in the field to shield workers.

2. Traffic safety drums, tall channelization devices, or 36 inch cones required for all lane closure tapers on roadway 45 mph or higher. (Halp spacing required for tall channelization devices and 36 inch cones).

3. Devices should not encroach into adjacent lanes.

4. Use transverse devices in closed lane every 102 ft when the work operation allows.

5. Downstream taper device spacing should be 20’ when a taper is used.

6. Coordinate with Region Traffic office for work hour restrictions.

7. Close the ramp when the work area location restricts ramp access.

**TCP 15**

**TYPICAL TEMPORARY ON-RAMP FOR MULTI-LANE ROADWAYS**
Typical Right Lane Closure with Shift - 5 Lane Roadway

**NOTES**

1. Protective vehicle with TMA required on roadways 45 mph or higher. On roadways 40 mph or less the protective vehicle shall be strategically located in the field to shield the work area.

2. Extend device taper across shoulder if applicable.

3. Coordinate with region traffic office for work hour restrictions.

4. If the lane shift is short and has minimal curve radius (30 mph or less) use sign W1-3 in lieu of sign W1-4.

5. Address pedestrian control through or around the work area.

**TYPICAL RIGHT LANE CLOSURE WITH SHIFT - 5 LANE ROADWAY**
TCP 17
**Chapter 2 Stationary Work Zones**

**WSDOT Work Zone Traffic Control Guidelines for Maintenance Operations**

**M 54-44.08**

**January 2021**

**TCP 18**

**Typical Left Lane and Center Turn Lane Closure - 5 Lane Roadway**

**NOTE**

1. Protective vehicle with TMA required for roadways 45 mph or higher. For roads 40 mph or less - shall be a work vehicle strategically located to shield work area.

2. Coordinate with the Region Traffic Office for work hour restrictions.
Stationary Work Zones Chapter 2

WSDOT Work Zone Traffic Control Guidelines for Maintenance Operations

TCP 21
Typical Lane Shift with Two Way Left Turn Lane

**SIGN SPACING = X (1)**

| RURAL ROADS | 45-55 MPH | 520+ ft. |
| RURAL ROADS & URBAN ARTERIALS | 35-40 MPH | 325+ ft. |
| URBAN STREETS | 25-30 MPH | 200+ ft. |

**MINIMUM LANE SHIFT TAPER LENGTH = L/2**

<table>
<thead>
<tr>
<th>MPH</th>
<th>TAPER</th>
<th>TANGENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>50-65</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35-45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>20-30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

**LONGITUDINAL BUFFER SPACE = B**

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (ft)</td>
<td>200</td>
<td>150</td>
<td>100</td>
<td>50</td>
<td>25</td>
<td>10</td>
</tr>
</tbody>
</table>

**MAXIMUM CHANNELIZATION DEVICE SPACING (feet)**

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>45</th>
<th>50</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPACING (ft)</td>
<td>12</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>40</td>
</tr>
</tbody>
</table>

**PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R**

| HOST VEHICLE WEIGHT |
|---|---|
| 5,000 TO 20,000 lbs. | 20,001+ lbs. |
| UP TO 40 MPH | UP TO 40 MPH |
| 45-55 MPH | 45-55 MPH |
| 100 | 123 |

**NOTES**

1. For long term projects, conflicting pavement markings no longer applicable shall be removed or obliterated as soon as practicable. Temporary markings shall be used as necessary and signs shall be post mounted.

2. For speed limits of 60 mph or less, use sign W1-7 in lieu of sign W1-4.

3. Extend device taper across shoulder if applicable.

4. Protective vehicle with TMA required for roads 45 mph or higher. For roads 40 mph or less - shall be a work vehicle placed strategically to shield work area.

5. Address pedestrian control
through or around the work area.

**LEGEND**

- SIGN LOCATION
- SIGN LOCATION - 5' MOUNTING HEIGHT - RECOMMENDED
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE REQUIRED

**TYPICAL LANE SHIFT WITH TWO WAY LEFT TURN LANE**

TCP 21
Chapter 3  Short Duration Work Zones

The following typical TCPs are a generic and are not drawn to scale. It is encouraged to modify these plans to fit your specific location and operation.

See Section 1-9.10 and 1-9.11 For condition guidance.

TCP 22  Typical Short Duration Shoulder Work
Encroachment into the adjacent live lane or the vertical clearance above the live lane is not allowed with this plan.

TCP 23  Typical Short Duration Work Operation (Intersection Application)
For intersections that have traffic signals, flagging may be required depending on the work location. A flagging plan with full signing would be required.

TCP 24  Typical Very Short Duration Work Operation (Outside Traveled Way)
It is preferable to park the work vehicle on the same side of the roadway as the work area.

TCP 25  Typical Very Short Duration Work Operation (Multi-Lane Application, Low Speed, 40 mph or Lower)
Work shall not actually close or block the lane. As vehicles approach it is incumbent upon the worker to move back to the shoulder.

TCP 26  Typical Very Short Duration In-lane Work (Multi-Lane Freeway and Highway Application, High Speed, 45 mph or Higher)
Work shall not actually close or block the lane.

TCP 27  Typical Very Short Duration Lane Closure (Two-Lane Highway)
The spotter method to alert the worker to move back to the shoulder as traffic approaches. Work that cannot allow traffic to pass through the work location will need to use the lane closed method or consider a short duration or stationary lane closure.

TCP 28  Typical Very Short Duration Work Operation (Intersection Application)
WORK ZONE CONDITION (SEE CHAPTER 1.9.10)

A - ALLOWED - CONSIDER USING A SPOTTER
B - ALLOWED - SPOTTER AND/OR CHANNELIZING DEVICES RECOMMENDED, CONSIDER TMA AND/OR PCMS/ARROW CAUTION MODE.
C - ALLOWED - SPOTTER CHANNELIZATION DEVICES AND PCMS/ARROW RECOMMENDED, CONSIDER TMA.

NOTES:
1. Restricted sight distance requires additional advance warning devices or signs, see sight distance chart.
2. Narrow shoulders that do not provide for work operations without lane encroachment - requires lane closure.
3. Refer to taper and buffer space charts.
4. If no TMA is available, the work vehicle may be strategically placed to shield work area.
5. Roadway example represents typical location. Optional location may be: left or right shoulders, median, gore area, or shoulder on multi-lane roadway.

MINIMUM STOPPING SIGHT DISTANCE = R

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (ft)</td>
<td>115</td>
<td>155</td>
<td>200</td>
<td>250</td>
<td>305</td>
<td>360</td>
<td>395</td>
<td>425</td>
<td>455</td>
<td>500</td>
</tr>
</tbody>
</table>

DISTANCES ARE A MINIMUM USE ADDITIONAL SPACE WHEN POSSIBLE.

STATIONARY TRANSPORTABLE ATTENUATOR ROLL AHEAD DISTANCE = R

<table>
<thead>
<tr>
<th>HOST VEHICLE WEIGHT</th>
<th>HOST VEHICLE WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.100 TO 22,000 lbs.</td>
<td>22,001+ lbs.</td>
</tr>
<tr>
<td>UP TO 40 MPH</td>
<td>45-55 MPH</td>
</tr>
<tr>
<td>100</td>
<td>192</td>
</tr>
</tbody>
</table>

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R

NO SPECIFIED DISTANCE REQUIRED STRATEGICALLY POSITION WORK VEHICLE TO PROTECT WORK CREW.

TCW 22
TYPICAL SHORT DURATION SHOULDER WORK

LEGEND

- | SIGN LOCATION (SEE NOTE 1)
- | WORK VEHICLE WITH WARNING BEACON
- | ARROW BOARD (CAUTION MODE)
- | TRUCK MOUNTED ATTENUATOR (RECOMMENDED)
- | CHANNELIZING DEVICE (RECOMMENDED)
- | SPOTTER (RECOMMENDED)
WORK ZONE CONDITION (SEE CHAPTER 1.9.10)
A - ALLOWED - CONSIDER USING A SPOTTER
B - ALLOWED - SPOTTER RECOMMENDED, CONSIDER TMA
AND/OR PCMS/ARROW CAUTION MODE.
C - ALLOWED - CHANNELIZATION DEVICES AND PCMS/ARROW
(CAUTION MODE), TMA AND SPOTTER RECOMMENDED,
VEHICLE #1 REQUIRED.

MINIMUM STOPPING SIGHT DISTANCE = S

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (ft)</td>
<td>115</td>
<td>155</td>
<td>200</td>
<td>250</td>
<td>305</td>
<td>360</td>
<td>425</td>
<td>495</td>
<td>570</td>
<td>645</td>
<td>730</td>
<td>820</td>
</tr>
</tbody>
</table>

DISTANCES ARE A MINIMUM
USE ADDITIONAL SPACE WHEN POSSIBLE.

NOTES:
1. Restricted sight distance requires additional advance
warning sign or work vehicle with a Caution Mode
Display. See Sight Distance Chart.
2. Work vehicle located in same quadrant as work location.
3. Work within the actual intersection may require a
specific TCP. Intersection work includes islands
and turn pockets.

LEGEND

SIGN LOCATION (SEE NOTE 1)

WORK VEHICLE WITH WARNING BEACON
(LOCATE TO SHIELD WORK AREA)

ARROW BOARD (CAUTION MODE)

CHANNELIZING DEVICE (RECOMMENDED)

TYPICAL SHORT DURATION WORK OPERATION
(INTERSECTION APPLICATION)
(SEE GUIDANCE TEXT FOR ADDITIONAL DIRECTION)
TCP 23
WORK ZONE CONDITION (SEE CHAPTER 1.9.10)

A - ALLOWED - CONSIDER USING A SPOTTER

B - ALLOWED - SPOTTER AND/OR CHANNELIZING DEVICES

RECOMMENDED, CONSIDER TMA AND/OR PCMS/ARROW

CAUTION MODE

C - ALLOWED - SPOTTER, CHANNELIZING DEVICES AND

PCMS/ARROW RECOMMENDED, CONSIDER TMA.

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE - R

<table>
<thead>
<tr>
<th>HOST VEHICLE WEIGHT</th>
<th>HOST VEHICLE WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>22,000 lbs.</td>
<td>22,001 lbs.</td>
</tr>
<tr>
<td>UP TO 40 MPH</td>
<td>45-55 MPH</td>
</tr>
<tr>
<td>60+ MPH</td>
<td>UP TO 40 MPH</td>
</tr>
<tr>
<td></td>
<td>45-55 MPH</td>
</tr>
<tr>
<td></td>
<td>60+ MPH</td>
</tr>
<tr>
<td>100'</td>
<td>123'</td>
</tr>
<tr>
<td>127'</td>
<td>74</td>
</tr>
<tr>
<td>100'</td>
<td>150'</td>
</tr>
</tbody>
</table>

STATIONARY TRANSPORTABLE ATTENUATOR ROLL AHEAD DISTANCE - R

TCP 24

Typical Very Short Duration Work Operation (Outside Traveled Way)

LEGEND

WORK VEHICLE WITH WARNING BEACON

(LOCATION TO SHIELD WORK AREA)

WORK AREA

SPOTTER (RECOMMENDED)

CHANNELIZING DEVICES (RECOMMENDED)

NOTES:
1. ACCESS ON FOOT ACROSS LANES IS ALLOWED EXCEPT UNDER CONDITION "C".

TYPICAL VERY SHORT DURATION WORK OPERATION (OUTSIDE TRAVELED WAY)
(HIGH OR LOW SPEED SHOULDER WORK, MEDIAN, GORE, RAMP SHOULDER, ETC.)

TCP 24
TCP 25  Typical Very Short Duration Work Operation
(Multi-Lane Application, Low Speed, 40 mph or Lower)
Chapter 3 Short Duration Work Zones

WORK ZONE CONDITION (SEE CHAPTER 1.9.10)

A. ALLOWED
B. ALLOWED - CONSIDER SPOTTER FOR LANE CLOSURE METHOD
C. NOT RECOMMENDED, CONSIDER MOBILE OR STATIONARY TCPs

NOTES:
1. THIS TCP DEPICTS TWO WORK ZONE STRATEGIES:
   Spotter method ~ (Arrow board optional).
   Lane Closed method ~ (Arrow board required).
2. For locations with 3 or more lanes, interior lane must be closed with either a rolling slowdown operation, mobile or stationary lane closures.
3. Shoulder width must allow vehicle access.

TYPICAL VERY SHORT DURATION IN LANE WORK
(MULTI-LANE FREEWAY AND HIGHWAY APPLICATION, HIGH SPEED, 45 MPH OR HIGHER)
TCP 25
WORK ZONE CONDITION (SEE CHAPTER 1.9.10)

- A - ALLOWED, VEHICLE #1 REQUIRED. (SEE METHOD NOTES FOR INFORMATION ON VEHICLE #2 AND SPOTTER USE)
- B - ALLOWED, VEHICLE #1 REQUIRED. (SEE METHOD NOTES FOR INFORMATION ON VEHICLE #2 AND SPOTTER USE)
- C - NOT RECOMMENDED, CONSIDER MOBILE OR STATIONARY TCP'S.

TYPICAL VERY SHORT DURATION LANE CLOSURE (TWO-LANE HIGHWAY)

NOTES:
1. THIS TCP DEPICTS TWO WORK ZONE STRATEGIES:
   - Spotter method - (Vehicle #2 recommended for 45MPH or higher)
   - Arrow board method - (Vehicle #2 always required) spotter optional.
2. Stopping traffic for up to 5 minutes may also be allowed.
   (Contact & coordinate with Region traffic office)
WORK ZONE CONDITION (SEE CHAPTER 1.9.10)

A  - ALLOWED - CONSIDER USING A SPOTTER,
B  - ALLOWED - SPOTTER RECOMMENDED
   CONSIDER ADDITIONAL WARNING SIGNS,
C  - NOT ALLOWED - SEE TCP 5 & 6 FOR
   ADDITIONAL WORK ZONE REQUIREMENTS.

MINIMUM STOPPING SIGHT DISTANCE = S

<table>
<thead>
<tr>
<th>SPEED (MPH)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>LENGTH (ft)</td>
<td>115</td>
<td>120</td>
<td>125</td>
<td>130</td>
<td>135</td>
<td>140</td>
<td>145</td>
<td>150</td>
<td>155</td>
<td>160</td>
<td>165</td>
<td>170</td>
</tr>
</tbody>
</table>

DISTANCES ARE A MINIMUM
USE ADDITIONAL SPACE WHEN POSSIBLE.

NOTES:
1. Work vehicle w/beacon located in same quadrant as work location.
2. Repeated access to work lane not allowed, see TCP 5 & 6 for work zone requirements - condition "C".
3. Restricted sight distance requires additional advance warning devices or signs, see sight distance data chart.
4. Recommend working during off-peak time if signalized.
5. See chapter 1.9.10 - 1.9.11 for additional direction.
Chapter 4  Mobile Operations

Mobile work zones are for work activities that move along the road continuously (sweeping, mowing, pavement marking applications) or intermittently with short stops for pothole patching, litter bag pickup, herbicide spraying, lane marker replacement or other similar operations.

An advanced warning PCMS is recommended and warning signs move ahead with the work, usually mounted on a shadow vehicle. Truck mounted PCMS, attenuators, and warning lights are some of the devices that may be used for moving operations. Contact the Region Traffic Office Staff for assistance selecting appropriate PCMS messages.

Mobile work zones are well suited to many maintenance operations and can be an efficient way to accomplish many types of work, but due to the moving nature of these operations and lack of channelization devices when closing a lane, careful consideration of traffic and roadway conditions as they relate to the specific operation must be done prior to using this type of traffic control.

The following TCPs depict typical examples of mobile work zones:

TCP 29  Typical Mobile Freeway Operation, Left Shoulder Closed  
For work operations that can be accomplished on the shoulder without encroachment into the adjacent lanes.

TCP 30  Typical Mobile Freeway Operation, Left Lane Closure  
For work operations on the left shoulder or in the lane.

TCP 31  Typical Mobile Freeway Operation, Middle Lane Work Area  
For multi-lane freeway applications where the work takes place in the middle lanes, this plan depicts a mobile double left-lane closure operation.

TCP 32  Typical Mobile Operation, Two Lane Roadway Lane Closure  
For mobile operations on a rural two-lane, two-way roadway with "in lane" work.

TCP 33  Typical Mobile Operation, Two Lane Roadway Shoulder Closure  
For mobile operations on a rural two-lane, two-way roadway with no encroachment.
Typical Mobile Freeway Operation Left Shoulder Closed

OPERATIONAL NOTES
1. Advance warning vehicle #1 use an arrow board in caution mode or truck mounted PCMS. Maintain 8 to 10 seconds of following distance (TMA recommended).
2. Use of advance warning vehicle should be considered whenever workers are within a vehicle or forward of the work vehicle, required when workers are behind the work vehicle.
3. Protective vehicle #2 position vehicle to provide protection of crew. Maintain roll-ahead distance (TMA required).
4. Use a mobile lane closure if flare encoachment is necessary.
5. Contact Regional Traffic Management Center prior to work begin and end.
6. Right shoulder closure operations use the same operation. Interchange ramps need additional consideration. On-ramps will require a vehicle to hold traffic until the operation passes the ramp merge area.
7. Static advance warning PCMS is recommended.

LEGEND

VEHICLE WITH WARNING BEACON

ARROW BOARD (CAUTION MODE)

TRUCK MOUNTED ATTENUATOR

TYPICAL MOBILE FREeway OPERATION
LEFT SHOULDER CLOSED
TCP 29
TCP 30  Typical Mobile Freeway Operation Left Lane Closure

**OPERATIONAL NOTES**

1. Advance warning vehicles #1 use an arrow board to warn approaching traffic. Use of truck mounted POMS is recommended.
2. Maintain 15 to 18 seconds of headway to the advance warning vehicle to provide protection of crew. Maintain reasonable speeds.
3. Maintain continuous alternate lane closures when practical.
4. Contact Region Traffic Management Center prior to work begins and after ending.

**TYPICAL MOBILE FREEWAY OPERATION**

**LEFT LANE CLOSURE**

**Legend**

- Vehicle with warning beacon
- Arrow board
- Truck mounted attenuator

**TABLE OF OPERATIONAL DISTANCES**

<table>
<thead>
<tr>
<th>Lane Speed (mph)</th>
<th>Distance (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 30</td>
<td>150 to 225</td>
</tr>
<tr>
<td>30 to 45</td>
<td>225 to 330</td>
</tr>
<tr>
<td>45 to 60</td>
<td>350 to 480</td>
</tr>
<tr>
<td>60+</td>
<td>600 or more</td>
</tr>
</tbody>
</table>

**NOTES**

- Strategically position POMS to signal drivers of work zone.
- Maintain proper work zone speed limits.
- Keep vehicles moving.
- Maintain a minimum of 6 work crew members.
- Use a single advance warning vehicle near the work zone.
- Use auxiliary lane equipment where practical.
- Use lane control and traffic control devices.
- Use intermittent stops, if necessary.
- Use POMS where practical.
Chapter 4 Mobile Operations

TCP 31

Typical Mobile Freeway Operation Middle Lane Work Area

LEGEND

Vehicle with Warning Beacon

Arrow Board

Truck Mounted Attenuator

Typical Mobile Freeway Operation Middle Lane Work Area

Operational Notes

1. Advance warning vehicle #1 use an arrow board in chevron mode or truck mounted PCMS. Maintain 8 to 10 seconds sight distance to approaching vehicles. (TMA recommended).

2. Shadow vehicle #2 maintain 8 to 10 seconds of sight distance to approaching traffic (TMA required).

3. Protective vehicle #3 position vehicle to provide protection of crew. Maintain roll ahead distance (TMA required).

4. A 2' minimum lateral clearance recommended between vehicles and adjacent lane. Use a rolling slowdown operation or stationary lane closure if lane narrowing is necessary.

5. Contact Region Traffic Management center prior to work begin and end.

6. Right lane closure operations use the same operation. Interchange ramps need additional consideration. On-ramps will require a vehicle to hold traffic until the operation passes the ramp merge.

7. Static advance warning PCMS recommended.
**OPERATIONAL NOTES**

1. Advance warning vehicle #1 use truck mounted PCMS and maintain 8 to 10 seconds of sight distance to approaching vehicles. (TMA recommended).

2. The work vehicle and protective vehicle #2 may need to move to the shoulder at times to allow traffic backups to clear.

3. Contact Regional Traffic office staff for assistance with specific in lane operations such as sliping, fog seal, etc, that require additional plans and details.

**LEGEND**

- ![Vehicle with Warning Beacon](image)
- ![Truck Mounted Arrow Board/PCMS](image)
- ![Truck Mounted Attenuator](image)

**Typical Mobile Operation**

**Two Lane Roadway Lane Closure**

**TCP 32**
**Chapter 4 Mobile Operations**

**WSDOT Work Zone Traffic Control Guidelines for Maintenance Operations**

**M 54-44.08**

**January 2021**

---

**TCP 33**

**Typical Mobile Operation Two Lane Roadway Shoulder Closure**

---

**OPERATIONAL NOTES**

1. Protective vehicle #1, use an arrow board in caution mode or truck mounted PCMS. Maintain 8 to 10 seconds of sight distance to approaching traffic.

2. Contact Regional Traffic Office staff for assistance with specific in lane operations such as striping, fog seal, etc. that require additional plans and details.

3. No encroachment into the traffic lane with work or protective vehicles.

---

**LEGEND**

- **VEHICLE WITH WARNING BEACON**
- **ARROW BOARD (CAUTION MODE)**
- **TRUCK MOUNTED ATTENUATOR (RECOMMENDED)**

---

**PCMS**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHOULDER WORK</td>
<td>SLOW MOVING VEHICLES</td>
</tr>
</tbody>
</table>

**4.0 SEC 2.0 SEC**

**TRUCK MOUNTED PCMS**

---

**MOBILE TRANSPORTABLE ATTENUATOR ROLL AHEAD DISTANCE = R**

<table>
<thead>
<tr>
<th>HOST VEHICLE WEIGHT</th>
<th>HOST VEHICLE WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>9,000 to 22,000 lbs.</td>
<td>22,001+ lbs.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UP TO 40 MPH</th>
<th>41-45 MPH</th>
<th>46+ MPH</th>
</tr>
</thead>
<tbody>
<tr>
<td>100'</td>
<td>172'</td>
<td>225'</td>
</tr>
<tr>
<td>100'</td>
<td>150'</td>
<td>172'</td>
</tr>
</tbody>
</table>

**PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R**

- **NO SPECIFIED DISTANCE REQUIRED,**
- **STRATEGICALLY POSITION WORK VEHICLE TO PROTECT WORK CREW.**

---

**Typical Mobile Operation Two Lane Roadway Shoulder Closure**

TCP 33
Chapter 5  Special Details

The following detail plans show examples which are difficult to show on other traffic control plans or where additional guidance is necessary.

**TCD 1  Shoulder Excavation Protection**
This detail provides guidance to drop-off protection and providing a recoverable slope if a vehicle were to drive off the edge of the roadway in a work zone during non-work hours.

**TCD 2  Typical Motorcycle Signing Detail**
This detail provides examples for sign placement in using the Motorcycles Use Extreme Caution sign in coordination with specific warning signs.

Place the warning sign in advance of the Motorcycle warning sign. (See RCW 47.36.200 and WAC 468-95-305.

**TCD 3  Typical Speed Zone Detail for Chip Seal Project**
Guidance for the signing requirements in chip seal projects with reduced work zone speed limits.

**TCD 4  Typical Work Beyond the Shoulder**
Typical example taken from MUTCD application that details minimum signing requirements for work within 15 feet of the edge of roadway.

**TCD 5  Typical Long-Term Shoulder Closure on High Speed Roadway**
Typical example taken from the MUTCD, this plan depicts the signing and channelizing device requirements for shoulder closure operations, particularly operations with barrier.

**TCD 6  Typical Rolling Slowdown**
See detailed operational guidance that accompanies this plan.

**TCD 7  Example Warning Signs for Emergencies**
See detailed operational guidance that accompanies this plan.

**TCD 8  Temporary Pavement Marking Details**
This detail sheet provides descriptions and typical layouts as needed.

**TCD 9  Typical Intersection Pedestrian Traffic Control**
This plan depicts typical signing examples for closing of a sidewalk during work zone operations. Specific pedestrian needs must be considered prior to any work beginning that impacts pedestrian pathways. Special attention must be given to pedestrian ADA accommodations. Consult with Region Traffic Office for assistance with specific issues or needs to provide the appropriate pedestrian controls.
TCD 10  Typical Mobile Shoulder Operation with Lane Encroachment
For mobile operations on a rural two-lane, two-way roadway with lane encroachment and limited sight distance.

TCD 11  Typical Exit Gore Channelization Details
This example is for use during paving operations in the vicinity of an exit gore, the existing pavement markings are commonly covered by new pavement and the markings are not visible, so this detail shows a method to create a temporary physical gore for use until the permanent pavement marking is installed.
ADDITIONAL REQUIRED WARNING SIGNS
LOCATE APPROACHING CONDITION AFTER SHOULDER CLOSURE SIGNING

MOTORCYCLES
USE EXTREME
CAUTION

ABRUPT
LANE
EDGE

W22-1701
48" x 48"
B/O

W21-801
48" x 48"
B/O

NOTES
1. Not allowed on freeways. Conduct all operations to minimize any drop-offs
   (abrupt changes in roadway elevation) left exposed during nonworking hours.
2. Shoulder excavation shall be limited to one side of roadway at a time, less
   than 2 feet and not remaining for more than three days.
3. Other channelizing devices may be used in lieu of a drum at 40 MPH or less.
4. Refer to TCP 9 or 10 for shoulder closure requirements and information.

SHOULDER EXCAVATION PROTECTION
TCD 1
### Typical Motorcycle Signing Detail

**SIGN SPACING = X (1)**

<table>
<thead>
<tr>
<th>Type</th>
<th>Minimum Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeways &amp; Expressways</td>
<td>55-75 MPH</td>
</tr>
<tr>
<td>Rural Highways</td>
<td>60-65 MPH</td>
</tr>
<tr>
<td>Rural Roads</td>
<td>40-50 MPH</td>
</tr>
<tr>
<td>Urban Roads/Urban Arterials</td>
<td>35-40 MPH</td>
</tr>
<tr>
<td>Residential &amp; Business Districts</td>
<td>25-30 MPH</td>
</tr>
</tbody>
</table>

1. All spacings may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways.
2. These spacings may be reduced in urban areas to fit roadway conditions.

---

**LEGEND**

- **X**: Sign Location
- **D**: Channelizing Devices

---

**NOTES**

1. Refer to other tabs for typical lane and shoulder closure signing, channelizing device spacing, and taper length details.
2. Use of appropriate warning signs for road condition required along with the motorcycle warning sign as per WAC 468-95-365.
TCD 3  SPEEDZONE DETAIL FOR CHIP SEAL PROJECTS

Speed limit reductions must be approved by the Region Traffic Engineer prior to installing speed reduction signing. See the Traffic Manual Appendix 5B for the approval process and request forms.

The regulatory speed may be reduced as low as 25 MPH during initial rock application and brooming. After the final brooming, the speed limit reduction shall be removed or moved ahead with operation.

Traffic Control Plan shown on next page
NOTES:
1. The road work ahead sign may be replaced with other appropriate signs such as shoulder work or mowing ahead.
2. The road work ahead sign may be omitted where the work area including all equipment vehicles and material are behind barrier more than 24 inches behind the curb or 15 feet or more from the edge of any roadway.
3. A general warning sign such as road machinery ahead should be used if workers and equipment must occasionally move onto the shoulder.
4. Work operations such as mowing where the mower is off the shoulder is allowed under this plan.
### Chapter 5 Special Details

#### WSDOT Work Zone Traffic Control Guidelines for Maintenance Operations

**TCD 5**

##### Typical Long-Term Shoulder Closure on High Speed Roadway

<table>
<thead>
<tr>
<th>Sign Spacing - X (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREEWAYS &amp; EXPRESWAYS</td>
</tr>
<tr>
<td>RURAL HIGHWAYS</td>
</tr>
<tr>
<td>RURAL ROADS</td>
</tr>
<tr>
<td>RURAL ROADS &amp; URBAN ARTERIALS</td>
</tr>
<tr>
<td>URBAN STREETS</td>
</tr>
</tbody>
</table>

**Shoulder Closure Taper Length = L/3**

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taper (feet)</td>
<td>40</td>
<td>40</td>
<td>40</td>
<td>60</td>
<td>60</td>
<td>90</td>
<td>90</td>
<td>150</td>
<td>200</td>
<td>200</td>
<td>200</td>
<td>200</td>
</tr>
</tbody>
</table>

**Maximum Channelization Device Spacing (feet)**

<table>
<thead>
<tr>
<th>MPH</th>
<th>Taper</th>
<th>Tangent</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>35-45</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>20-30</td>
<td>20</td>
<td>40</td>
</tr>
</tbody>
</table>

**Longitudinal Buffer Space = B**

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (feet)</td>
<td>115</td>
<td>115</td>
<td>200</td>
<td>250</td>
<td>305</td>
<td>360</td>
<td>425</td>
<td>495</td>
<td>570</td>
<td>645</td>
<td>730</td>
<td>820</td>
</tr>
</tbody>
</table>

**Barrier Taper Rates**

<table>
<thead>
<tr>
<th>MPH</th>
<th>Taper</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>1-1/4</td>
</tr>
<tr>
<td>60</td>
<td>1-1/2</td>
</tr>
<tr>
<td>55</td>
<td>1-1/2</td>
</tr>
<tr>
<td>50</td>
<td>1-1/2</td>
</tr>
<tr>
<td>45</td>
<td>1-1/2</td>
</tr>
</tbody>
</table>

**100' or Below**

**Notes**

1. Barrier end must be treated with approved temporary impact attenuator appropriate for the specific location.

**Legend**

- **SIGN LOCATION POST MOUNTED**
- **CHANNELIZING DEVICES**
- **TEMPORARY IMPACT ATTENUATOR**
- **TEMPORARY BARRIER**

**Typical Long-Term Shoulder Closure on High Speed Roadway**

TCD 5
TCD 6  **Rolling Slowdown**

A rolling slowdown is a legitimate form of traffic control commonly practiced by the WSP and highway maintenance crews. This use is valuable for emergency, or very specific short duration closures (e.g. to pick debris from the roadway, to push a blocking disabled to the shoulder, or to pull power lines across the roadway). The traffic control vehicles form a moving blockade across all lanes, which reduce traffic speeds and create a large gap in traffic, or clear area, allowing very short-term work to be accomplished without completely stopping the traffic.

Other traditional forms of traffic control such as lane closures should be considered first and as the primary choice when possible. If the slowdown is to be a scheduled operation, then the Regional Traffic Office needs to be contacted with a work request so a site specific traffic control plan (TCP) can be developed and/or reviewed and approved. The gap in traffic created by the rolling slowdown, and other traffic issues, should be addressed on an approved TCP. Also, use of WSP is encouraged whenever possible, at a minimum coordination with WSP is necessary.

In the event of debris in the roadway, a blocking disabled vehicle, or other emergency, the use of experience and resources at hand, along with sound judgment and common sense, will suffice in lieu of an approved, site specific, TCP. **TCD 6** has been developed as a guideline to represent the basic requirements for performing a safe and effective rolling slowdown. Site specific TCPs can be developed based on this plan.

Equipment availability is a prime consideration. Before starting this operation, ensure there is at least one protective/blockade vehicle (TMA recommended) per each lane, and one work vehicle to cover every point of access (on-ramp) into the "rolling slowdown" segment of roadway and one more to serve as the chase vehicle. (Only during emergencies should less than protective/blockade vehicle per lane be considered.) Truck mounted PCMS boards are very beneficial in helping drivers understand the operation. **Be sure that every crewmember participating is well briefed and knows what is needed from them. Good communications for this operation are essential!**

The traffic control vehicles leading the rolling slowdown must enter the roadway far enough upstream from the work operation site to allow a clear area in front of them to develop. The traffic control vehicles will work into position so that each lane is controlled. As in every other form of traffic control, sight distance is important, so that drivers are not surprised. While traveling at a fixed and reduced rate of speed, a gap in traffic must be created which is long enough to provide the estimated time needed for the work to be done.
A separate traffic control vehicle, “chase vehicle,” shall follow the slowest, or last, vehicle ahead of the blockade. When that last vehicle passes, the crew can begin the work operation.

All ramps and entrances to the roadway between the moving blockade and work operation must be temporarily closed using traffic control equipment and personnel.

Each of those ramps must remain closed until the crew doing the work gives the “all clear” signal, or until the front of the moving blockade passes the closed on-ramp(s).

Radio communications between the work crew and the moving blockade are required so the speed of the blockade can be adjusted, if necessary, to increase or decrease the closure time. Release traffic only after you have confirmation that all workers and their vehicles are clear of the roadway.

**Rolling Slowdown Calculations**

**Rolling Slowdown Equations**

Known Variables:

\[ T_{CLEAR} = \text{Clear time needed to complete all work minutes} \]
\[ V_{RS} = \text{Rolling slowdown target speed mph} \]
\[ V_{TRAFFIC} = \text{Slowest Traffic Vehicle Speed Expected mph} \]

Variables to be Determined:

\[ D_{RS} = \text{Minimum rolling slowdown distance ahead to starting point miles} \]
\[ T_{RS} = \text{Rolling slowdown duration minutes} \]

Equations:

\[ D_{RS} = \frac{T_{CLEAR} \times V_{RS} \times V_{TRAFFIC}}{60 \times (V_{TRAFFIC} - V_{RS})} \]
\[ T_{CLEAR} = \frac{60 \times (V_{TRAFFIC} - V_{RS}) \times D_{RS}}{V_{RS} \times V_{TRAFFIC}} \]
\[ T_{RS} = \frac{60 \times D_{RS}}{V_{RS}} \]
\[ V_{RS} = \frac{60 \times D_{RS}}{T_{RS}} \]
Example Rolling Slowdown Calculations

On a posted 60 MPH freeway you need 10 minutes of clear time to perform a maintenance operation or temporary repair.

Known Variables:

\[ T_{\text{CLEAR}} = 10 \text{ minutes} \]
\[ V_{\text{RS}} = 60 - 40 = 20 \text{ mph} \]

*Note:* Rolling slowdown target speed is 40 mph less than 60 mph speed limit.

\[ V_{\text{TRAFFIC}} = 60 \text{ mph} \]

*Note:* Traffic speed based on 60 mph speed limit. Use truck speed limits if present and consider steep grades effect on speeds.

Equations:

\[ D_{\text{RS}} = \frac{T_{\text{CLEAR}} \times V_{\text{RS}} \times V_{\text{TRAFFIC}}}{60 \times (V_{\text{TRAFFIC}} - V_{\text{RS}})} \]
\[ D_{\text{RS}} = \frac{10 \times 20 \times 60}{60 \times (60 - 20)} = \frac{12000}{2400} = 5.00 = 5.0 \text{ miles} \]

\[ T_{\text{RS}} = \frac{60 \times D_{\text{RS}}}{V_{\text{RS}}} \]
\[ T_{\text{RS}} = \frac{60 \times 5.00}{20} = \frac{300}{20} = 15 \text{ minutes} \]

The slowdown operation will need to start a minimum of 5 miles in advance of the work area and will take approximately 15 minutes to reach the work area. Work can begin once the chase vehicle clears all traffic past the work area.

Approximately 10 minutes of clear time will remain. All on-ramp traffic from the start point to the work area will need to be held until the slowdown operation completely passes the on-ramp.
This typical plan depicts the minimum requirements to conduct a rolling slowdown operation.
Site-specific plans and details should be developed and approved by the region traffic office prior to the operation.

LEGEND
- **Vehicle with warning beacon (required)**
- **Truck mounted attenuator (recommended)**
- **Arrow board caution mode (required)**

OPERATIONAL NOTES
1. The chase vehicle follows the last motorist vehicle past the work area to ensure all is clear.
2. Truck mounted poms may be used in place of caution mode display.
3. All on-ramp traffic shall be stopped until blockade vehicles pass the ramp merge area.
4. Use a calculated distance back from the work area to the starting point so work will be completed without stopping traffic.
5. Notify TMC and WSP prior to operation.

Typical Rolling Slowdown
TCD 6
Emergency Operations

The immediate response to an emergency must, by necessity, make use of whatever devices and equipment are available. Assistance from the Washington State Patrol and WSDOT Incident Response Team may be appropriate. The use of flares is allowed unless flammable material is present, electronic flares or glow sticks are an option for this condition.

Implement the appropriate traffic control plan (lane closure, etc.) if the situation is expected to last longer than 60 minutes. This allows for a short duration operation, until traffic control assistance arrives.

It is important to differentiate between an actual emergency and an emergent condition. An actual emergency requires an immediate response to save lives or prevent serious injury using whatever resources are available, usually in response to a crash or incident. An emergent condition requires an expedient yet planned response to a situation that may have the potential to cause a crash, but the crash has not yet occurred or a crash or other event has caused damage needing repair after the crash event. Most “call outs” or damage reports fall into the emergent condition category and although serious to varying degrees, still allow some period of time to plan a reasonable short duration work zone response, even if additional resources are needed once the condition is evaluated on site.

TCD 7 reflects various conditions and measures that might be applied as part of an emergency response for a natural disaster. More commonly, emergencies are those caused by vehicle crashes, breakdowns or spilled or lost cargo. Response to these types of emergencies is urgent and not specifically addressed by work zone standards. Refer to WSDOT Incident Response Program for guidance.

Response to an emergency is inherently more dangerous than planned situations. Do not expose yourself to a life-threatening situation. Always wait for assistance and protect yourself.
WORK OPERATIONS THAT REMOVE OR OBLIQUE EXISTING PAVEMENT MARKINGS MUST PROVIDE FOR TEMPORARY MARKINGS UNTIL THE PERMANENT MARKINGS ARE APPLIED. TEMPORARY MARKINGS MAY BE USED UNTIL IT IS PRACTICAL AND POSSIBLE TO INSTALL PERMANENT MARKINGS. THE DETAILS BELOW SHOW VARIOUS COMMON APPLICATIONS; CONTACT THE REGION TRAFFIC OFFICE FOR ASSISTANCE WITH MORE COMPLEX SITUATIONS.

**MULTI-LANE ROADWAYS**

**ASPHALT PAVEMENT**

```
36' 4' 40'
(2) 4" YELLOW TEMP TAPE LINES
```

---

**2 LANE ROADWAYS**

"PASS WITH CARE" AND "DO NOT PASS" SIGNS SHALL BE INSTALLED IN CONJUNCTION WITH TEMPORARY PAVEMENT MARKINGS.

**ASPHALT PAVEMENT**

```
4' 36' 40'
4" YELLOW TEMP TAPE OR PAINT LINE
```

---

**CHIP SEALED SURFACE**

```
WHITE TEMP RPM'S
6' 40' 3' 3' 3' 3'
```

---

**CHIP SEALED SURFACE**

```
YELLOW TEMP RPM'S
6' 34' 40'
```

---

**NOTES**

1. Temporary edge lines are not required; if used, place temporary rpm's at 5' spacing to simulate a solid line.
2. The edge line definition with channelizing devices should be considered, but are optional.
3. For long-term projects, a temporary pavement marking plan should be developed.

**TEMPORARY PAVEMENT MARKING DETAILS**

TCD 8
Typical Mobile Shoulder Operation with Lane Encroachment

Legend:
- Work vehicle with flashing amber warning beacon
- Shadow vehicle with flashing amber warning beacon (TMA recommended, but not required)

Operational Notes:
1. Daylight hours only.
2. Radio contact between work vehicle and shadow vehicle required.
3. PCMS recommended.
4. Use TCD 32 if lane encroachment is continual.

MOBILE SHOULDER OPERATION WITH LANE ENCOUCKMENT
TCD 10
TCD 11  

Typical Exit Gore Channelization Plan

LEGEND

- CHANNELING DEVICES - 45° BRAKING
- TEMPORARY MIN LOCATION

NOTES

1. Shoulder line extensions when marking individual gore is required.
2. Temporary lane bars required per TCD 6.

January 2021
Appendices

Appendix 1  Checklist for Establishing a Temporary Traffic Control Zone
Appendix 2  Taper/Channelizing Device Table
Appendix 3  Road Warrior Operations
Appendix 4  Freeway lane closures with shoulder driving and speed limit reductions
Appendix 5  Litter Crew Plans
# Appendix 1  Checklist for Establishing a Temporary Traffic Control Zone*

<table>
<thead>
<tr>
<th>Completed</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐</td>
<td>Determine the duration of work (Stationary, Short-Duration, very short duration or Mobile)*</td>
</tr>
<tr>
<td>☐</td>
<td>Select an appropriate TCP for the work based on location, duration, type of roadway, motor vehicle traffic volume and speed. (See volume considerations in Section 1-9.10).</td>
</tr>
<tr>
<td>☐</td>
<td>Make any necessary modifications to the TCP to address site specific conditions like intersections, driveways or sight distance restrictions. Document these modifications.*</td>
</tr>
<tr>
<td>☐</td>
<td>Make accommodations for pedestrians and ADA needs as appropriate. Accommodate all travel modes such as bicyclists, transit and school operations as dictated by context and presence of these modes.</td>
</tr>
<tr>
<td>☐</td>
<td>Determine work hours avoiding peak traffic times (refer to a region work hour chart or contact the Region Traffic Office for assistance)*</td>
</tr>
<tr>
<td>☐</td>
<td>Check the condition and availability of devices (refer to Quality Guidelines Booklet).</td>
</tr>
<tr>
<td>☐</td>
<td>Install devices in the direction of traffic beginning with the first device or sign the driver will see. Follow spacing and layout as per the TCP or modified TCP.</td>
</tr>
<tr>
<td>☐</td>
<td>Allow for buffer space free of obstructions.</td>
</tr>
<tr>
<td>☐</td>
<td>Conduct a drive through to check for problems. Make adjustments as appropriate. Document these adjustments.</td>
</tr>
<tr>
<td>☐</td>
<td>Continuously maintain devices while in place.</td>
</tr>
<tr>
<td>☐</td>
<td>Remove devices as soon as the work is completed, beginning with the last device placed.</td>
</tr>
</tbody>
</table>

*Utilize the Region Traffic Office staff for assistance to address specific concerns and questions.
## Merging, Shifting, and Shoulder Taper Lengths and Number of Channelization Devices Used

(All minimums)

<table>
<thead>
<tr>
<th>Lane Width</th>
<th>10 Feet</th>
<th></th>
<th>11 Feet</th>
<th></th>
<th>12 Feet</th>
<th></th>
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<tr>
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<td>L 1/2 L</td>
<td>L 1/2 L</td>
<td>L 1/2 L</td>
<td>L 1/2 L</td>
<td>L 1/2 L</td>
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<tr>
<td>MPH</td>
<td>Merging Devices</td>
<td>Shifting Devices</td>
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<tr>
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<td>350 10</td>
<td>770 20</td>
<td>385 11</td>
<td>840 22</td>
<td>420 12</td>
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</table>

### Shoulder Tapers

(Assumes 10' Shoulders)

<table>
<thead>
<tr>
<th>MPH</th>
<th>Length (ft)</th>
<th>Devices</th>
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<tr>
<td>20</td>
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<td>3</td>
</tr>
<tr>
<td>25</td>
<td>35</td>
<td>3</td>
</tr>
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<td>30</td>
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<td>220</td>
<td>7</td>
</tr>
<tr>
<td>70</td>
<td>235</td>
<td>7</td>
</tr>
</tbody>
</table>

* The number of channelizing devices listed is the minimum required. Use of more devices should be considered if additional delineation is desired.

** Termination taper, when used should have a minimum length of 100 ft per lane with devices placed approximately 20 ft O.C.

### Shoulder Width x Speed / 3

### Device Spacing Chart

<table>
<thead>
<tr>
<th>Speed Range</th>
<th>Device Spacing</th>
<th>Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>50/70 mph</td>
<td>40 ft</td>
<td>80 ft</td>
</tr>
<tr>
<td>35/45 mph</td>
<td>30 ft</td>
<td>60 ft</td>
</tr>
<tr>
<td>25/30 mph</td>
<td>20 ft</td>
<td>40 ft</td>
</tr>
</tbody>
</table>
Appendix 3  Road Warrior Operations

This appendix addresses the proper operations for WSDOT employees that are working from a Road Warrior setting/retrieving traffic control devices. The intent of this procedural document is to ensure that these operations across the state are performed in a like manner.

1. References:
   - WAC 296-880 Unified Safety Standards for Fall Protection
   - WAC 296-865 Safety Standards for Motor Vehicles
   - DOSH Directive 6.55 Channelizing Device Placement and Operations

2. Operations:
   - Road Warriors are designed to set and retrieve traffic control devices in work zones which involves vehicle movement while employees are on the rear deck of the vehicle.
   - Any time employees are working on the deck of the road warrior it shall be shadowed by another vehicle equipped with a truck-mounted attenuator (TMA) with the appropriate roll ahead distance.
     - **Exception:** In a flagging operation, (TCP 1), or a pilot car operation, (TCP 2), the road warrior may be utilized without the aid of an additional TMA to set delineation devices if traffic is stopped at the flagger station in the direction of its travel.
   - The speed at which these operations occur shall not exceed 20 mph.
   - The driver of the vehicle shall maintain constant communication with the employees on the vehicle. In high speed and/or high volume traffic it may be required to have an electronic communication system between the driver and the employee in the well of the vehicle. The communication method used shall be described in the Pre Activity Safety Plan, (PASP), for the operation. All employees in the operation shall understand what communication procedures are in place.
   - Employees shall not be transported while on the deck of the road warrior at any speed unless they are setting/removing traffic control devices. Sign setting operations shall be accomplished by employees exiting/entering the cab or the employees must be restrained on the deck/well of the road warrior. When restrained employees are setting signs from the deck/well, the road warrior shall not travel more than 20 mph between signs.
3. Employees working from the well of the vehicle:

When employees are setting or removing traffic control devices while in the well of the road warrior a fall restraint system shall be utilized at all times. All anchorages and fall restraint equipment in use shall meet the minimum requirements of **WAC 296-880** Unified Fall Protection. These are the current methods of accomplishing this for the employees:

- The employee in the well shall be in a seated position and seat belted in place to restrict their ability to exit the vehicle. The seat and seat belts shall be secured to structural members of the vehicle.
- The employee in the well shall be secured to the vehicle with a fall restraint system designed to prevent the workers center of gravity from reaching the fall hazard. This can be accomplished two ways:
  - This can be accomplished by utilizing a short, (approximately two foot), lanyard that is attached to the hip “D” rings of the full body harness and secured to the recessed anchorage point in the deck of the vehicle. This allows the employee enough movement to perform their job function but eliminates the potential fall hazard.
  - This can also be accomplished by securing the employee to an overhead anchorage point that is in a location that will prevent the employee from reaching the fall hazard with their center of gravity. (This shall be accomplished with an adjustable length positioning lanyard that has been adjusted to the appropriate length based on the anchorage location and the worker height.)
- Supervisors and other employees on the deck shall ensure that all employees are keeping the restraint lanyards as short as possible while allowing them the ability to complete the work at hand.

4. Employees working from the deck of the vehicle:

When any employee is setting or removing traffic control devices while on the deck of the road warrior a fall restraint system shall be utilized at all times. All anchorages and fall restraint equipment in use shall meet the minimum requirements of **WAC 296-880** Unified Fall Protection.

- To accomplish this, overhead anchorage points are provided that are designed to meet the requirements of **WAC 296-155-24615** Fall Restraint Specifications, (WAC 296-880-220 Personal Fall Restraint Requirements). These anchorage points, shall at a minimum, have the ability to support four times the intended load that they could be subjected to.
- The employees shall attach directly to these anchorages with an adjustable length, positioning lanyard that is attached to the dorsal “D” ring of their harness. These shall be kept at the minimum length necessary for them to be able to accomplish the work at hand while not having the potential to reach a fall hazard.
- The well cover opposing the cone/barrel setting operation is to be in the lowered/closed position at all times.
5. **Completion of the cone/barrel setting operation:**

   After all cones/barrels are set up in the work zone, the employees will vacate the rear of the vehicle and be seated in the cab of a vehicle wearing the appropriate seat belts to travel out of the work area.

6. **Training:**

   All employees that are working on the deck or in the well of the road warrior shall be trained on these procedures. They shall also be trained in the proper selection, use and inspection of the fall restraint system in use. This training shall be provided by the Regional Safety Office, the Regional Maintenance Trainer, or other authorized employees.
Appendix 4 Freeway Lane closures with Speed Limit Reductions

This appendix provides typical plans when a single open freeway lane is partially shifted onto the shoulder, allowing the work area to extend laterally over the lane line.

This shoulder shift configuration is necessary whenever the work area extends over the lane line, and a buffer lane closure is not available, to complete work operations occurring across the entire lane (such as HMA paving, concrete paving, or expansion joint rehabilitation). This occurs on two-lane freeways, but also for work in the middle lane on three-lane freeways.

Both work zone variable regulatory speed limit and advisory speeds listed in Table 4-1 are required and must be approved through Region Traffic Operations.

Table 4-1 Freeway Variable Regulatory Work Zone Speed Limit and Advisory Speed Policy

<table>
<thead>
<tr>
<th>Existing Speed Limit</th>
<th>Variable Regulatory Work Zone Speed Limit</th>
<th>Advisory Speed At Work Crew</th>
</tr>
</thead>
<tbody>
<tr>
<td>70 mph</td>
<td>55 mph</td>
<td>40 mph</td>
</tr>
<tr>
<td>60 mph</td>
<td>45 mph</td>
<td>40 mph</td>
</tr>
</tbody>
</table>

Notes:

- Maintaining the existing posted speed limit is prohibited
- Advisory speeds are required in advance of work crews, W23-5 and W23-6 signage shall be used in advance
- Radar Speed Display Sign, with W23-6, is recommended for Maintenance.

It is understood there will be unique situations that may warrant adjustments to values listed in Table 4-1 based on engineering judgement, but these adjustments are limited to 5 +/- mph to maximize consistency statewide.

See Section 5-18 the Traffic Manual for additional information and work with your Region Traffic Engineer for work zone speed limit reduction approvals and notifications.
Freeway (2-Lane): Single Left Lane Closure with Right Shoulder Shift
**Freeway (3-Lane): Double Left Lane Closure with Right Shoulder Shift**

**Minimum Lane Closure Taper Length = L**
- **lane width (inches):**
  - 12 L (feet) = 540 660

**Minimum Shoulder Closure Taper Length = L/3**
- **speed (MPH):**
  - 6 L/3 (feet) = 90 120
  - 10 L/3 (feet) = 150 200

**Stationary Transportable Attenuator**
- ROLL AHEAD DISTANCE = R
  - host vehicle weight: 9,900 to 22,000 lbs.
  - > 22,000 lbs.

**Channelization Device Spacing**
- **MPH:**
  - 45 40 30
- **taper (feet):**
  - 80 60 40

**Minimum Longitudinal Buffer Space = B**
- **speed (MPH):**
  - 45 55
- **length (feet):**
  - 360 450

**Legend**
- Temporary Sign Location
- Temporary Sign Location (5 Min./Night)
- Traffic Safety Drums
- Tall Channelization Devices
- Channelization Devices
- Radar Speed Display Sign
- Sequential Arrow Sign
- Portable Changeable Message Sign

**Notes**
1. Obtain Regional Approval for Reduced Work Zone Speed Limit and Advisory Speed Per Executive Order 138.
2. For existing 70 MPH zones, use 55 MPH work zone speed limit; for existing 60 MPH zones use 45 MPH speed limit.
3. Coordinate lane closures with regional traffic offices.
4. Avoid placing lane closure/taper taps within 500 ft. of horizontal curves or near on-ramp merges.
5. Traffic Safety Drums or Tall Channelization Devices are required for all lane closure/taper taps.
6. Use channelization required for all channelization Devices.
7. To maintain 40 mph prior to work area, optional speed radar display signs may be used 100 ft. prior to each work crew.
8. To maintain 40 mph prior to work area, optional speed radar display signs may be used 100 ft. prior to each work crew.
9. Use channelization required for all channelization Devices.
10. Use channelization required for all channelization Devices.
11. Use channelization required for all channelization Devices.
Freeway (2-Lane): Single Right Lane Closure with Left Shoulder Shift

Legend:
- Temporary sign location
- Temporary sign location (3 min. height)
- Traffic safety drums
- Tall channelization devices
- Channelization devices
- Radar speed display sign
- Portable array sign
- Portable changeable message sign

Minimum Lane Closure & Shift Taper Length = 1.4L

| Minimum Shoulder Closure Taper Length = L/3 |
|-----------------|-----------------|-----------------|
| Width (feet)    | Speed (MPH)     | Length (feet)   |
| 6               | 45              | 90              |
| 10              | 45              | 120             |

Use minimum 1 device for shoulder less than 6.

Minimum Longitudinal Buffer Space = B

| Stationary Transportable Attenuator Roll Ahead Distance = R |
|-----------------|-----------------|-----------------|
| Speed (MPH)     | Length (feet)   |
| 45              | 360             |
| 55              | 495             |

Channelization Device Spacing (feet):

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>Taper</th>
<th>Tangent</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>45</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

Trafﬁc Control Plan for Maintenance Operations

1. Obtain region approval for reduced work zone speed limits and advisory speed per executive order.
2. For existing 70 mph zones, use 55 mph work zone speed limit. For existing 60 mph zones use 45 mph work zone speed limit.
3. Coordinate lane closures with region trafﬁc operations.
4. Avoid placing lane closure/shift taper zones within sight of horizontal curves or near on-ramp merge.
5. Trafﬁc safety drums or tail channelization devices required for all lane closure/taper zones.
6. Additional spacing required for tall channelization devices.
7. Relocate to remain 500 ft. prior to work area.
8. Reopen taper option to allow maintenance vehicles to accelerate straight out of work area into the right lane.
9. For roadway, width restrictions of less than 15 feet contact design/Commercial Freight Services in advance for oversized freight truck restrictions.
10. Signs are black on orange unless otherwise indicated.
11. Traffic control plan for maintenance operations unless region trafﬁc approves otherwise.

Freeway (2-Lane): Single Right Lane Closure with Shift Onto Left Shoulder Shift

(Reduced Work Zone Speed Limit, 40 MPH Advisory Speed)
Freeway (3-Lane): Double Right Lane Closure with Left Shoulder Shift

Freeway (3-Lane): Double Right Lane Closure with Shift onto Left Shoulder Shift

(Reduced Work Zone Speed Limit, 40 MPH Advisory Speed)

1. Obtain Regional Approval for Reduced Work Zone Speed Limit and Advisory Speed Per Executive Order
2. For existing 60 MPH Zones, use 55 MPH Work Zone Speed Limit. For existing 50 MPH Zones use 45 MPH Work Zone Speed Limit
3. Coordinate Lane Closures with Regional Traffic Services
4. Avoid placing lane closure/shift taper within 500 ft of horizontal curves or near on-ramp merges
5. Traffic Safety Drums or Tall Channalization Devices Required for a Long Lane Closure/Taper Event
6. Recommander Taper is Optional to Allow Maintenance Vehicles to Accelerate Straight Out of Work Area into the Right Lane
7. For roadway width restrictions of less than 7.5 feet contact Regional Commercial Truck Services in advance for oversized freight truck restrictions
8. Signs are Black on Orange Unless Otherwise Indicated
9. Traffic Control Plan for Maintenance Activities Unless Regional Traffic Approves Otherwise
Appendix 5  Litter Crew Plans

This appendix provides minimum traffic control requirements for litter crews working along State Highways.
NOTES

1. CREW VEHICLE SHALL BE PARKED OFF THE PAVED SHOULDER.

2. MEDIAN WORK SHALL NOT EXTEND THROUGH FREEWAY INTERCHANGES. WORK AT INTERCHANGES SHALL BE TREATED AS A SEPARATE WORK ZONE AND CONDUCTED FROM WITHIN THE INTERCHANGE AREA.

3. LITTER CREW PERSONNEL ARE TO REMAIN OFF THE PAVED SHOULDERS AND SHALL NOT CROSS THE HIGHWAY ON FOOT.

4. MAXIMUM 2 MILE WORK AREA.

LITTER CREW TRAFFIC CONTROL PLAN
DIVIDED HIGHWAY MEDIAN WORK
NOTES

1. CREW VEHICLE SHALL BE PARKED OFF THE PAVED SHOULDER.
2. LITTER CREW PERSONNEL ARE TO REMAIN OFF THE PAVED SHOULDERS AND SHALL NOT CROSS THE HIGHWAY ON FOOT.
3. MAXIMUM 2 MILE WORK AREA.