

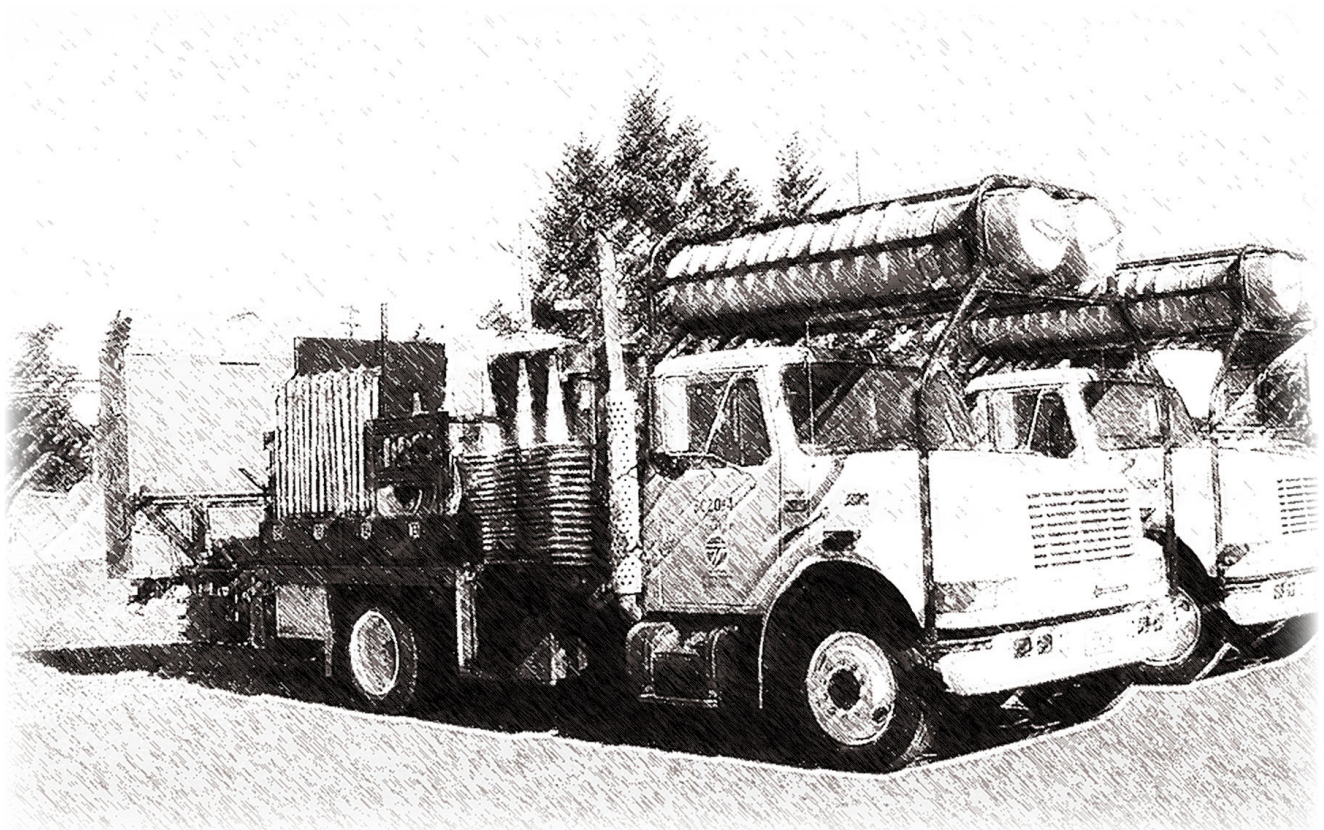


Washington State
Department of Transportation

Work Zone Traffic Control Guidelines for Maintenance Operations

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Americans with Disabilities Act (ADA) Information

English

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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 in close proximity to high-speed traffic. The traffic control guidelines in this manual are intended to reduce field personnel's exposure to the hazards of 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, traffic volumes, traffic speed, 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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Chapter 1 General Information

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1-1 Introduction

The primary function of work zone traffic control is to allow vehicles, cyclists, 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. Drivers and pedestrians need 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, traffic speed and volume, driveways and intersections 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 night time 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 in order 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 Appendix 5.A](#), 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 9](#) 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 in order to provide additional visibility. Sign supports should not be located on sidewalks or in bicycle lanes. When placed on shoulders, they should not block pedestrian and bicycle access when possible.

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” used along with, “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 actually 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 maintain a minimum 4-foot lateral clearance 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. Don't 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 actually 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.**

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. Tubular markers may be used to divide opposing traffic lanes, divide open lanes in the same direction on low speed roads and to delineate the edge of a pavement drop off.

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

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 or Tall Channelization Devices are required for lane closure tapers on multi-lane highways with posted speeds of 45 mph or greater. If Tall Channelization Devices are used, using half the maximum spacing to increase the taper visibility is required. Region Traffic Engineer approval is required to use 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 space.

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 when it is in a live lane. (meaning when signs and a channelization device taper closing the lane are not in place)**
- See the plans and details for TMA placement and roll ahead distance requirements.

1-6.10 Warning Lights

Warning lights 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 17 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. They are 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 an 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 18. 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 recommended best practice is to reduce traffic approaching the intersection to a single lane whenever possible. This may require lane closures and restricting access to turn pockets with channelization devices. This gives the flagger better control of traffic movements. If signalized, the 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 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 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, Bicycles, 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 10](#) of this manual for a typical plan for pedestrian traffic control.

1-8.1 Pedestrians

All pre-existing ADA compliant pedestrian facilities within the work zone must continue to comply with ADA requirements for access during work operations. 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 Plan Sheet Library under the Standard Plans site.
- 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.
- Do not place signs and other traffic control devices within the pathway.
- **For Sidewalk closures, advance closure/direction signs are required at the nearest upstream crossing to minimize pedestrian’s need to retrace their steps.**

1-8.2 Bicycles

- Bicycles have a legal right of access to most highway facilities and provisions for their safe conduct through work zones are necessary.
- 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.

1-8.3 Motorcycles

The driving or roadway surface is also important for motorcycle rider safety. The same surfaces that are a problem for bicyclist are also difficult for motorcyclists. Stability at high speed is a far greater concern for motorcycles than cars on grooved pavement, loose gravel, milled asphalt, and abrupt edge tapers from existing pavement down to milled surfaces. Adequate signing to warn for these conditions in work zone operations to alert the motorcycle rider are required by [RCW 47.36.200](#) and [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.
- School hours to minimize impacts.

1-9 Additional Work Zone Considerations

1-9.1 Work Zone Speed Limits

The speed limits on state highways are set by the State Traffic Engineer and cannot be changed without approval. 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. Speed reduction guidelines and requests are outlined in [RCW 47.48.020](#), Executive Order E 1060.02, and [Traffic Manual M 51-02](#), Appendix 5.B. 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.

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 often are 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. In an effort to provide consistency and guidance on how to best perform the operation the following steps have been provided.

1. **Prior to any operation beginning and before any crew member is exposed to live traffic the crew will discuss the daily pre-activity safety plan involving the activity.**
2. Within the pre-activity safety plan, discussion regarding the procedure for the setup and take down operation for the traffic control is to be decided and all crew members will be fully aware of their duties and what is expected of them.
3. 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 and the plan will be onsite during work 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 19).

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.

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.) impacting 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.

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 27 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 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 across a two-lane highway or intersection.
- Rough estimate of traffic volume at less than five vehicles per lane per minute.

- **moderate 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 across a two-lane highway or intersection exist, but may require waiting for a gap in traffic.
- Rough estimate of traffic volume at 12 vehicles per lane per minute.

- **high volume**
 - Minimal gaps in traffic.
 - Constantly present vehicles.
 - Restricted or unstable traffic flow.
 - Reduced traffic speeds, as volume starts to approach road capacity.
 - A safe walking condition to across a two-lane highway or intersection may not exist.
 - A rough estimate of 20 vehicles per lane per minute.

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 26 and TCP27).**
 - **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 14 or TCP15 may be required.**
2. **A determination of a safe work location must be made.** A basic determination can be made by observing traffic conditions (speed, volume, location, visibility, etc.) and assessing the following conditions:
 - Is the work location out of the traffic path?
 - Is there sufficient time for a worker to safely walk (not run) to and return from the work location?
 - Are there other hazards 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 Plans](#) 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](#)

[FHWA Manual on Uniform Traffic Control Devices \(MUTCD\)](#)

ATSSA's Quality Guidelines for Temporary Traffic Control Devices and Features

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 Single-Lane Closure for Multi-Lane Roadways***
- TCP 4** ***Typical Double-Lane Closure for Multi-Lane Roadways***
- TCP 5** ***Typical Shoulder Closure – Low Speed (40 mph or Less)***
- TCP 6** ***Typical Shoulder Closure – High Speed (45 mph or Higher)***
- TCP 7** ***Typical Temporary Off-Ramp for Multi-Lane Roadways***
(Details an off-ramp connection during a short-term lane closure)
- TCP 8** ***Typical Temporary On-Ramp for Multi-Lane Roadways***
(Details an on-ramp add-lane connection during a short-term lane closure)
- TCP 9** ***Typical Temporary On-Ramp for Multi-Lane Roadways***
(Details an on-ramp merge connection during a short-term lane closure)
- TCP 10** ***Typical Right Lane Closure with Shift – 5 Lane Roadway***
(For an urban setting using the two-way left turn lane for through traffic in one direction)
- TCP 11** ***Typical Left Lane and Center Turn Lane Closure – 5 Lane Roadway***
(For an urban setting creating an inside lanes work area with through traffic maintained in the outside lanes in each direction)
- TCP 12** ***Typical Lane Shift – Three Lane Roadway***
(This plan details maintaining one lane in each direction in truck lane sections)
- TCP 13** ***Typical Short-Term Ramp Closures***
(This plan details both off-ramp and an on-ramp closures at interchanges)
- TCP 14** ***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 15** ***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 16** ***Typical Single-Lane Closure with Shift***
(This plan details closing a lane on a 4-lane divided highway with a shift onto the shoulder for work access to the entire closed lane.)
- TCP 17** ***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 18** ***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 19** ***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 20** ***Short Term Traffic Stop with Flaggers***
(For two-lane, two-way roadways when short traffic stops are needed)
- TCP 21** ***Outside Lane Closures – Five-Lane Roadway***
(Typical urban location with two through lanes each direction and a center turn lane. This plan may be used when work will require short traffic stops for both directions of traffic.)
- TCP 22** ***Typical Lane Shift with Two Way Left Turn Lane***
(This plan details maintaining one lane in each direction using the TWLTL)

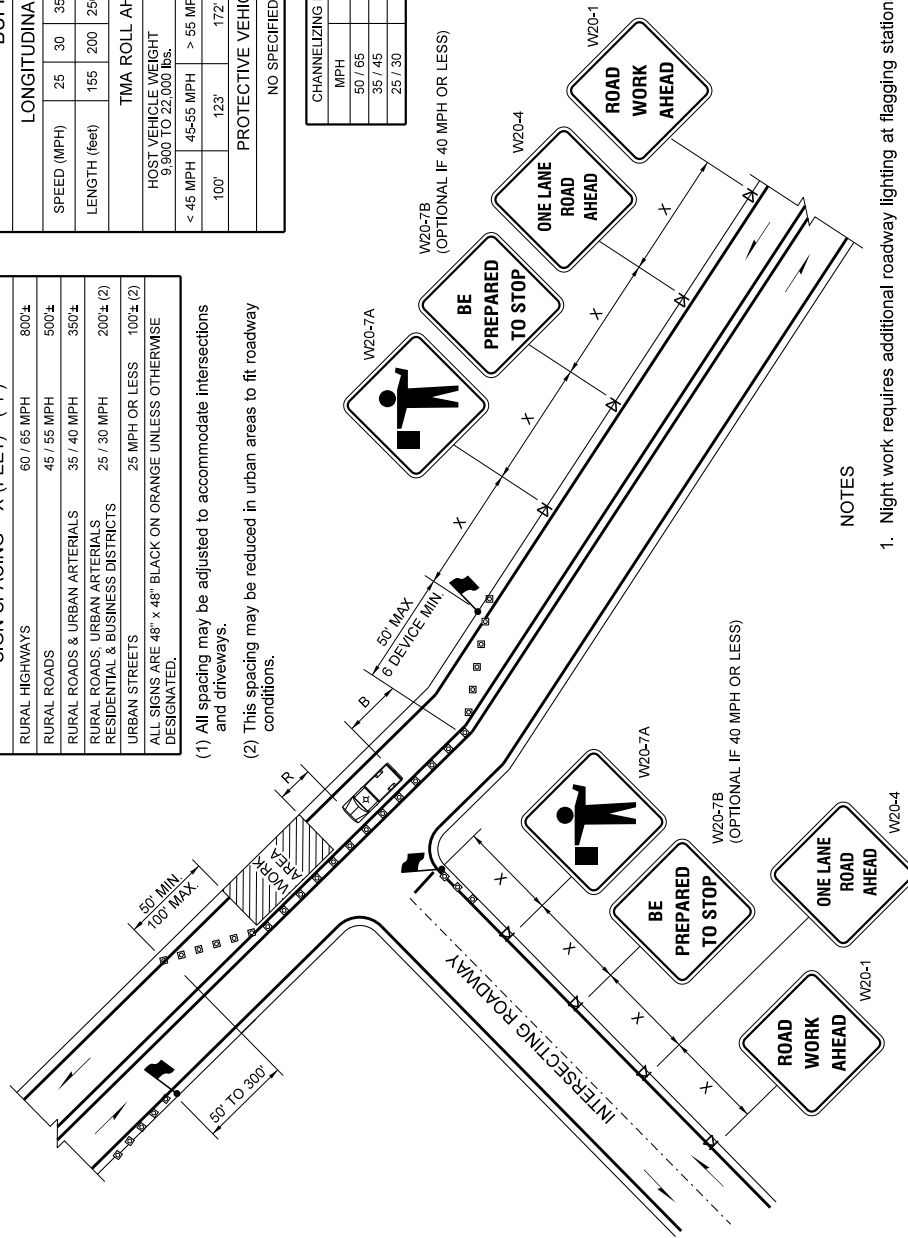
TCP 1 Typical One-Lane, Two-Way Traffic Control with Flaggers

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	495	570	645	730
TMA ROLL AHEAD DISTANCE = R										
HOST VEHICLE WEIGHT					HOST VEHICLE WEIGHT					
9,900 TO 22,000 lbs.					> 22,000 lbs.					
< 45 MPH	45-55 MPH	> 55 MPH	< 45 MPH	> 55 MPH	45-55 MPH	> 55 MPH	> 55 MPH	> 55 MPH	> 55 MPH	> 55 MPH
100'	123'	172'	74'	100'	100'	100'	100'	100'	100'	150'
PROTECTIVE VEHICLE (WORK VEHICLE) = R										
NO SPECIFIED DISTANCE REQUIRED										

SIGN SPACING = X (FEET) (1)	
RURAL HIGHWAYS	60 / 65 MPH 800±
RURAL ROADS	45 / 55 MPH 500±
RURAL ROADS & URBAN ARTERIALS	35 / 40 MPH 350±
RURAL ROADS, URBAN ARTERIALS RESIDENTIAL & BUSINESS DISTRICTS	25 / 30 MPH 200± (2)
URBAN STREETS	25 MPH OR LESS 100± (2)

(1) All spacing may be adjusted to accommodate intersections and driveways.
 (2) This spacing may be reduced in urban areas to fit roadway conditions.

CHANNELIZING DEVICE SPACING (FEET)	
MPH	TAPER
50 / 65	40
35 / 45	30
25 / 30	20



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 - may be a work vehicle strategically located to shield the work area.
4. For low-volume situations with short 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 longitudinal buffer space to locate the taper in advance of a curve, if necessary.

LEGEND

- FLAGGING STATION
- SIGN LOCATION
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE

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

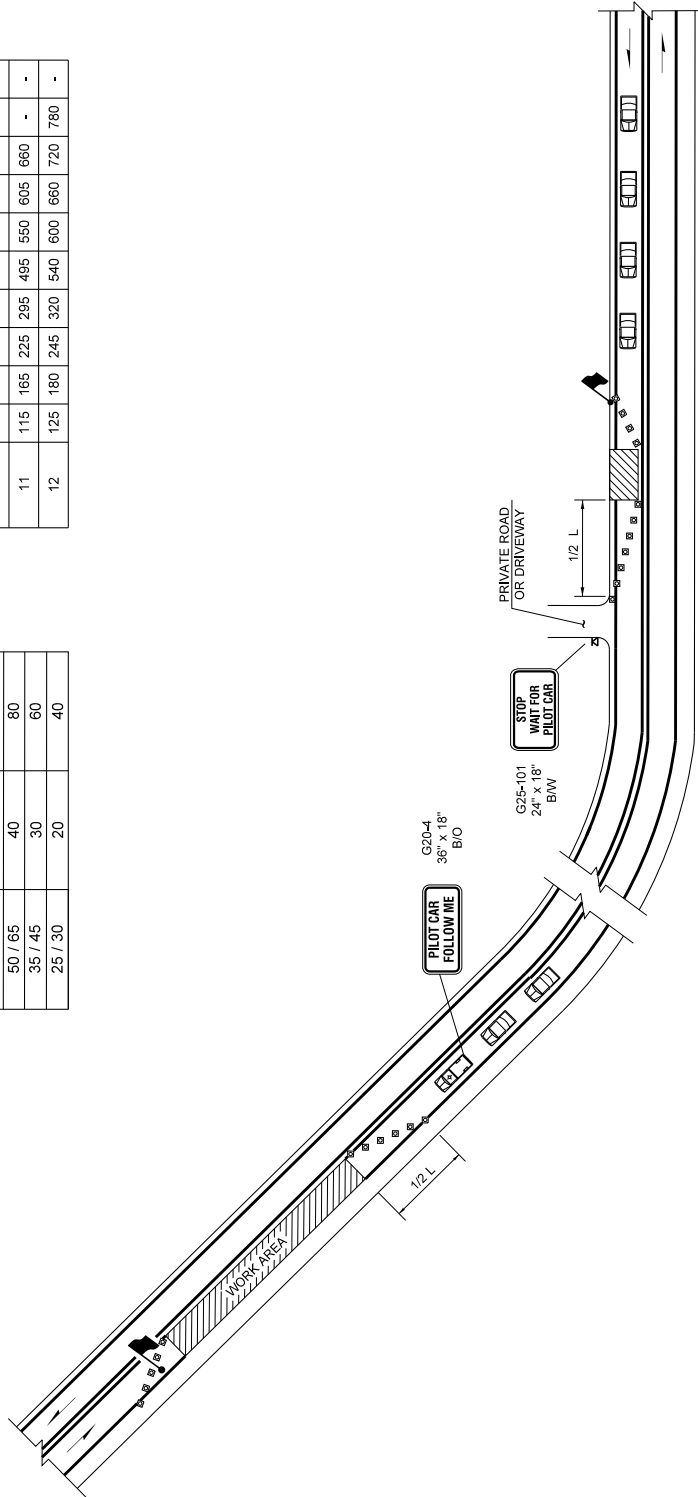
TCP 2 Typical Pilot Car Operation

MINIMUM TAPER LENGTH = L (feet)

Lane Width (feet)	Posted Speed (mph)										
	25	30	35	40	45	50	55	60	65	70	75
10	105	150	205	270	345	420	500	580	660	750	840
11	115	165	225	295	375	460	550	640	730	820	910
12	125	180	245	320	400	490	580	670	760	850	940

CHANNELIZING DEVICE SPACING (FEET)

MPH	TAPER	TANGENT
50 / 65	40	80
35 / 45	30	60
25 / 30	20	40



NOTES

1. Refer to sheet TCP 1 for additional signing and flagging details not shown.
2. Channelizing devices are recommended along centerline to separate traffic from work operation. Devices are required at tapers to shift traffic movement between lanes and for protection at all flagging stations.
3. Sign G25-101 is recommended for non-stop sign controlled approaches such as private driveways. This sign can be made of alternative materials other than aluminum.

LEGEND

- FLAGGING STATION
- SIGN LOCATION
- CHANNELIZING DEVICES
- PILOT VEHICLE
- MOTORIST VEHICLE

TYPICAL PILOT CAR OPERATION
TCP 2

TCP 3 Typical Single-Lane Closure for Multi-Lane Roadways

SIGN SPACING = X (FEET) (1)		
FREEWAYS & EXPRESSWAYS	55/70 MPH	1500'+
RURAL HIGHWAYS	60/65 MPH	800'±
RURAL ROADS	45/55 MPH	500'±
RURAL ROADS & URBAN ARTERIALS	35/40 MPH	350'±
RURAL ROADS, URBAN ARTERIALS, RESIDENTIAL & BUSINESS DISTRICTS	25/30 MPH	200'± (2)
URBAN STREETS	25 MPH OR LESS	100'± (2)

ALL SIGNS ARE 48" X 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

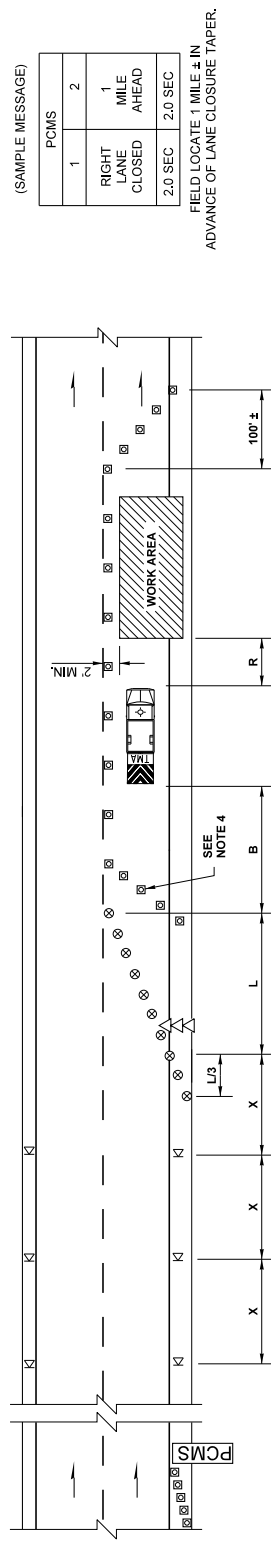
MINIMUM TAPER LENGTH = L (feet)	
LANE WIDTH (feet)	Posted Speed (mph)
25	30 35 40 45 50 55 60 65 70
10	105 150 205 270 450 500 550 - - -
11	115 165 225 285 495 550 605 660 - - -
12	125 180 245 320 540 600 660 720 780 840

MINIMUM SHOULDER TAPER LENGTH = L/3 (feet)	
SHOULDER WIDTH (feet)	Posted Speed (mph)
25	30 35 40 45 50 55 60 65 70
8'	40 45 50 60 70 80 90 100 110 120 130 140 150 160 170 180
10'	40 45 50 60 70 80 90 100 110 120 130 140 150 160 170 180 200 220 240

USE A MINIMUM 3 DEVICES TAPER FOR SHOULDER LESS THAN 8'.

BUFFER DATA	
LONGITUDINAL BUFFER SPACE = B	
SPEED (MPH)	25 30 35 40 45 50 55 60 65 70
LENGTH (feet)	155 200 250 305 360 425 495 570 645 730
TMA ROLL AHEAD DISTANCE = R	
HOST VEHICLE WEIGHT	9,900 TO 22,000 lbs.
< 45 MPH	> 55 MPH
100'	172'
123'	172'
150'	172'
172'	172'
100'	150'
150'	150'
PROTECTIVE VEHICLE (WORK VEHICLE) = R	
NO SPECIFIED DISTANCE REQUIRED	

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



CHANNELIZING DEVICE SPACING (FEET)	
MPH	TANGENT
50/70	40
35/45	30
25/30	20

- NOTES
- A TMA is required for roadway 45 mph or higher. For roads 40 mph or less - if a TMA is not available, the protective vehicle shall be strategically located in the field to shield workers and no roll ahead distance is specified.
 - Extend device taper across shoulder.
 - Devices should not encroach into adjacent lanes, see sheet TCP 16 for encroachment detail. The 2' lateral buffer is recommended.
 - Use transverse devices in closed lane every 1000' - when work operation allows.
 - Traffic safety drums or tall channelization devices required for all lane closure tapers on roadway 45 mph or higher. (Half spacing required for tall channelization devices).
 - When used, device spacing for the downstream taper should be 20' O.C.
 - Coordinate with Region Traffic office for work hour restrictions.

- LEGEND
- PCMS SIGN LOCATION
 - ARROW BOARD
 - TRAFFIC SAFETY DRUMS/TALL CHANNELIZATION DEVICES
 - CHANNELIZING DEVICES
 - TMA
 - PORTABLE CHANGEABLE MESSAGE SIGN (RECOMMENDED)

TYPICAL SINGLE-LANE CLOSURE FOR MULTI-LANE ROADWAYS
TCP 3

TCP 4 Typical Double-Lane Closure for Multi-Lane Roadways

SIGN SPACING = X (FEET) (1)

FREEWAYS & EXPRESSWAYS	55/70 MPH	1500' ±
RURAL HIGHWAYS	60/65 MPH	800' ±
RURAL ROADS	45/55 MPH	500' ±
RURAL ROADS & URBAN ARTERIALS	35/40 MPH	350' ±
RURAL ROADS, URBAN ARTERIALS, RESIDENTIAL & BUSINESS DISTRICTS	25/30 MPH	200' ± (2)
URBAN STREETS	25 MPH OR LESS	100' ± (2)

ALL SIGNS ARE 48" X 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

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

MINIMUM TAPER LENGTH = L (feet)

LANE WIDTH (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
10	105	150	205	270	450	500	550	-	-	-
11	115	165	225	295	495	550	605	660	-	-
12	125	180	245	320	540	600	660	720	780	840

MINIMUM SHOULDER TAPER LENGTH = L/3 (feet)

SHOULDER WIDTH (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
8'	40	40	60	90	120	130	150	160	170	190
10'	40	60	90	90	150	170	190	200	220	240

USE A MINIMUM 3 DEVICES TAPER FOR SHOULDER LESS THAN 8'.

BUFFER DATA

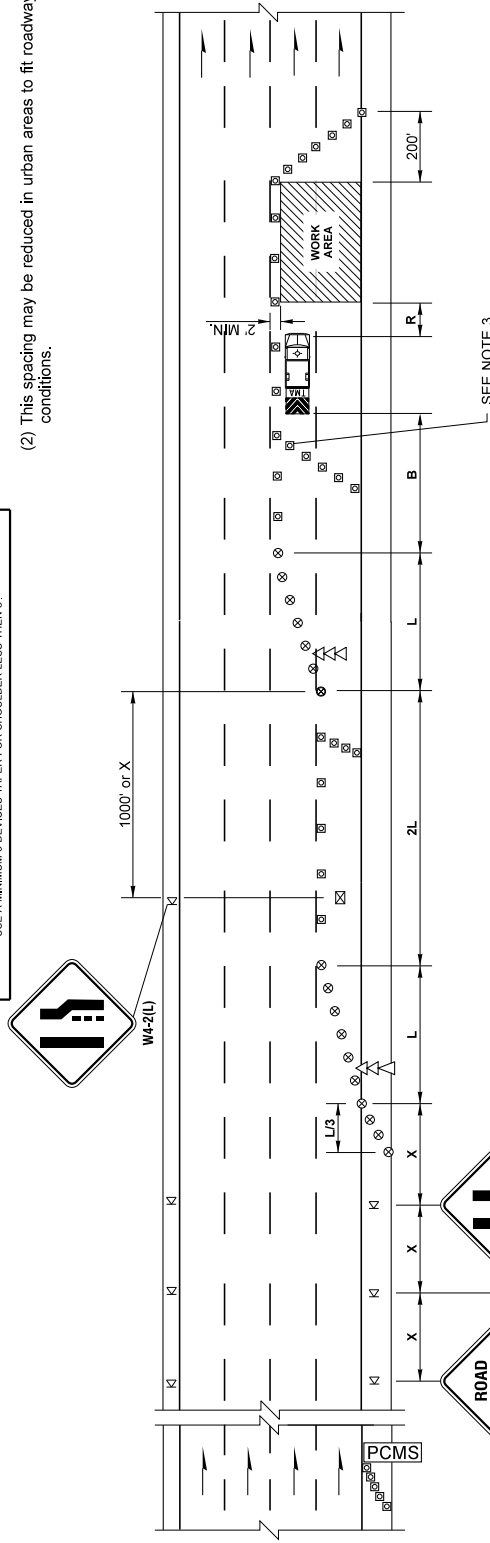
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	495	570	645	730

TMA ROLL AHEAD DISTANCE = R

HOST VEHICLE WEIGHT		
9,900 TO 22,000 lbs.		
< 45 MPH	> 55 MPH	> 55 MPH
100'	172'	74'

PROTECTIVE VEHICLE (WORK VEHICLE) = R

NO SPECIFIED DISTANCE REQUIRED



(SAMPLE MESSAGE)

PCMS	
1	RIGHT 2 LANES CLOSED AHEAD
2	MERGE LEFT AHEAD
2.0 SEC	2.0 SEC

NOTES

1. Protective vehicle with TMA required for roadway 45 mph or higher. For roads 40 mph or less - if no TMA is available, the protective vehicle shall be strategically located in the field to shield workers and no roll ahead distance is specified.
2. Devices should not encroach into adjacent lanes. The 2' lateral buffer is recommended.
3. Use transverse devices in closed lane every 1000' or when work operation allows.
4. Traffic safety drums or tall channelization devices required for all lane closure tapers on roadways 45 mph or higher. (Half spacing required for tall channelization devices).
5. When used, device spacing for the downstream taper should be 20' O.C.
6. Coordinate with region traffic office work hour restrictions.

FIELD LOCATE 1 MILE ± IN ADVANCE OF LANE CLOSURE TAPER.

CHANNELIZING DEVICE SPACING (FEET)

MPH	TAPER	TANGENT
50/70	40	80
40/45	30	60

LEGEND

- ⊠ SIGN LOCATION
- ⊞ SIGN LOCATION ~ 5' MOUNTING HEIGHT RECOMMENDED
- ⇨ ARROW BOARD
- ▨ TMA
- ⊞ CHANNELIZING DEVICES
- ⊞ TRAFFIC SAFETY DRUMS / TALL CHANNELIZATION DEVICES
- ⊞ PORTABLE CHANGEABLE MESSAGE SIGN RECOMMENDED

TYPICAL DOUBLE-LANE CLOSURE FOR MULTI-LANE ROADWAYS
TCP 4

TCP 5 Typical Shoulder Closure – Low Speed (40 mph or Less)

SHOULDER WIDTH (feet)	MINIMUM SHOULDER TAPER LENGTH = L/3 (feet)									
	Posted Speed (mph)									
8'	25	30	35	40	45	50	55	60	65	70
	40	40	60	90	120	130	150	160	170	190
10'	40	60	90	90	150	170	190	200	220	240

USE A MINIMUM 3 DEVICES TAPER FOR SHOULDER LESS THEN 8'

SIGN SPACING = X (FEET) (1)		
RURAL ROADS & URBAN ARTERIALS	35 / 40 MPH	350±
RURAL ROADS, URBAN ARTERIALS	25 / 30 MPH	200± (2)
RESIDENTIAL & BUSINESS DISTRICTS	25 MPH OR LESS	100± (2)
URBAN STREETS	25 MPH OR LESS	100± (2)

ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

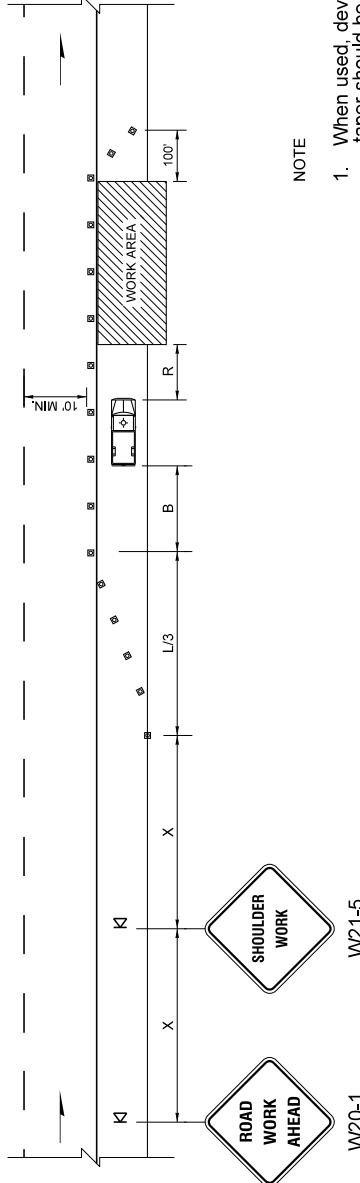
BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	--	--	--	--	--

TMA ROLL AHEAD DISTANCE = R		
HOST VEHICLE WEIGHT > 22,000 lbs.		
< 45 MPH	45-55 MPH	> 55 MPH
100'	--	74'

PROTECTIVE VEHICLE (WORK VEHICLE) = R	
NO SPECIFIED DISTANCE REQUIRED	

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

CHANNELIZING DEVICE SPACING (FEET)	
MPH	TANGENT
35 / 40	30
25 / 30	20
	40



NOTE

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

LEGEND

- SIGN LOCATION
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED

TYPICAL SHOULDER CLOSURE - LOW SPEED (40 MPH OR LESS)
TCP 5

TCP 6 Typical Shoulder Closure – High Speed (45 mph or Higher)

MINIMUM SHOULDER TAPER LENGTH = L/3 (feet)	
SHOULDER WIDTH (feet)	Posted Speed (mph)
25	30
30	35
35	40
40	45
45	50
50	55
60	65
70	70
8	40
90	90
120	130
150	160
170	170
190	200
220	220
240	240

USE A MINIMUM 3 DEVICES TAPER FOR SHOULDER LESS THAN 8'

SIGN SPACING = X (FEET)	
FREeways & EXPRESSWAYS	55 / 70 MPH
1500' ±	
RURAL HIGHWAYS	60 / 65 MPH
800' ±	
RURAL ROADS	45 / 55 MPH
500' ±	

ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

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

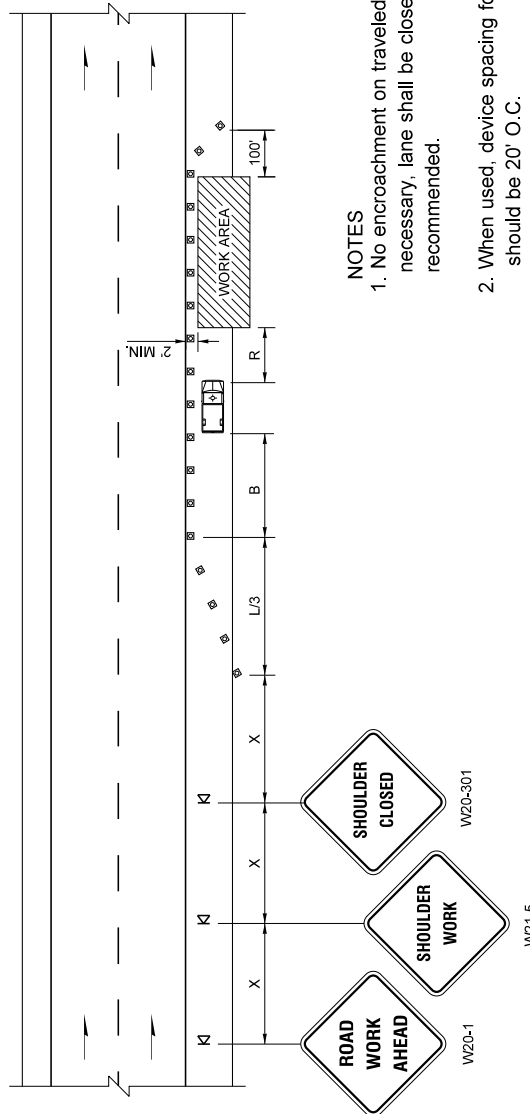
CHANNELIZING DEVICE SPACING (FEET)	
MPH	TAPER
50 / 70	40
80	80
45 / 50	30
60	60

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	495	570	645	730

TMA ROLL AHEAD DISTANCE = R	
HOST VEHICLE WEIGHT	HOST VEHICLE WEIGHT
9,900 TO 22,000 lbs.	> 22,000 lbs.
< 45 MPH	> 55 MPH
45-55 MPH	< 45 MPH
74'	100'
172'	150'

PROTECTIVE VEHICLE (WORK VEHICLE) = R

NO SPECIFIED DISTANCE REQUIRED



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 L taper and TMA.
4. TMA required for freeways.

LEGEND

- DI SIGN LOCATION
- ▣ CHANNELIZING DEVICES
- ▣ PROTECTIVE VEHICLE ~ REQUIRED

TYPICAL SHOULDER CLOSURE - HIGH SPEED (45 MPH OR HIGHER)
TCP 6

TCP 7 Typical Temporary Off-Ramp for Multi-Lane Roadways

LANE WIDTH (feet)	MINIMUM TAPER LENGTH = L (feet)									
	Posted Speed (mph)									
10	25	30	35	40	45	50	55	60	65	70
11	105	150	205	270	450	500	550	-	-	-
12	115	165	225	295	495	550	605	660	-	-
	125	180	245	320	540	600	660	720	780	840

SHOULDER WIDTH (feet)	MINIMUM SHOULDER TAPER LENGTH = L/3 (feet)									
	Posted Speed (mph)									
8'	25	30	35	40	45	50	55	60	65	70
10'	40	60	90	120	130	150	160	170	190	240

USE A MINIMUM 3 DEVICES TAPER FOR SHOULDER LESS THAN 8'.

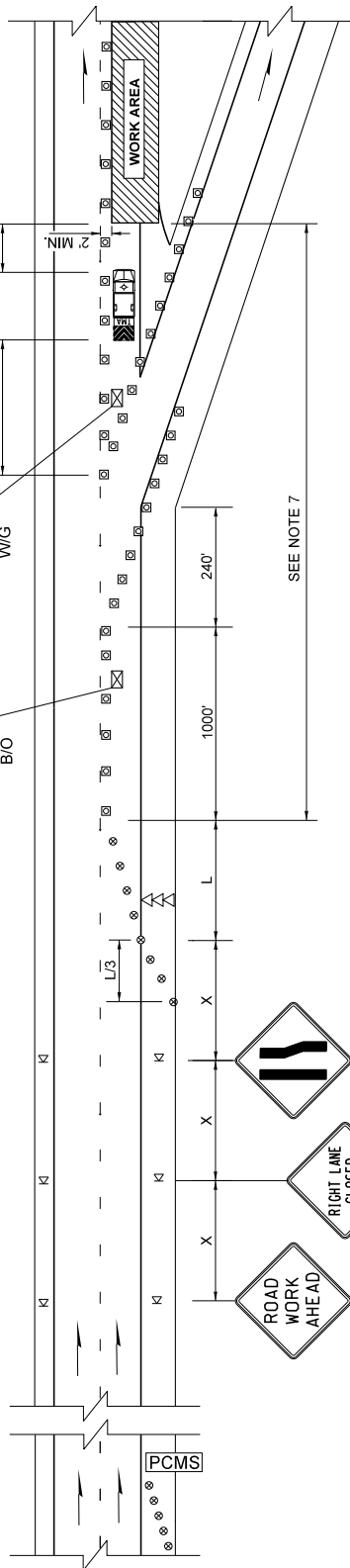
BUFFER DATA	
LONGITUDINAL BUFFER SPACE = B	
SPEED (MPH)	25 30 35 40 45 50 55 60 65 70
LENGTH (feet)	155 200 250 305 360 425 495 570 645 730
TMA ROLL AHEAD DISTANCE = R	
HOST VEHICLE WEIGHT 9,300 TO 22,000 lbs.	> 22,000 lbs.
< 45 MPH	45-55 MPH
> 55 MPH	45-55 MPH
100'	123'
172'	74'
100'	150'
PROTECTIVE VEHICLE (WORK VEHICLE) = R	
NO SPECIFIED DISTANCE REQUIRED	

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50 / 70	40	80
40 / 45	30	60

7' MOUNTING HEIGHT MIN. 48"

OPTIONAL SIGN
48"
EXIT
OPEN
E5-2a
B/O

48"
EXIT
E5-1
W/WG



NOTES

- Protective vehicle with TMA required for 45 MPH or higher. For roads 40 MPH or less ~ if TMA is not available, the vehicle may be strategically located to shield the work area.
- Coordinate with the region Traffic Office for work hour restrictions.
- Extend device taper across shoulder.
- Devices should not encroach into adjacent lanes. The 2' lateral buffer is recommended.
- Use transverse devices in closed lane every 1000' when work operations allow.
- Traffic safety drums or tall channelization devices are required for all lane closure tapers on roadways 45 mph or higher. (Half spacing required for tall channelization devices.)
- Consider short term closure of ramp for work in this area.

(SAMPLE MESSAGE)

PCMS	
1	RIGHT LANE CLOSED
2	EXIT RAMP OPEN
2.0 SEC	2.0 SEC

FIELD LOCATE 1 MILE ± IN ADVANCE OF LANE CLOSURE TAPER.

SIGN SPACING = X (FEET)		
FREWAYS & EXPRESSWAYS	55 / 70 MPH	1500 ±
RURAL HIGHWAYS	60 / 65 MPH	800 ±
RURAL ROADS	45 / 55 MPH	500 ±
RURAL ROADS & URBAN ARTERIALS	35 / 40 MPH	350 ±
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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

LEGEND

- ⊗ SIGN LOCATION
- ▷▷▷ ARROW BOARD
- PCMS PORTABLE CHANGEABLE MESSAGE SIGN - RECOMMENDED
- ⊗ ⊗ ⊗ TRAFFIC SAFETY DRUMS / TALL CHANNELIZATION DEVICES
- ⊗ ⊗ ⊗ CHANNELIZING DEVICES
- ⊗ ⊗ ⊗ SIGN LOCATION ~ 5' MOUNTING HEIGHT RECOMMENDED
- ⊗ TMA

TYPICAL TEMPORARY OFF-RAMP FOR MULTI-LANE ROADWAYS
TCP 7

TCP 8 Typical Temporary On-Ramp for Multi-Lane Roadways

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	495	570	645	730
TMA ROLL-AHEAD DISTANCE = R										
HOST VEHICLE WEIGHT 9,900 TO 22,000 lbs.										
< 45 MPH	100'	123'	172'	74'	100'	150'				
45-55 MPH										> 55 MPH

MINIMUM TAPER LENGTH = L (feet)										
Lane Width (feet)	25	30	35	40	45	50	55	60	65	70
10	-	-	-	270	450	500	550	-	-	-
11	-	-	-	295	485	550	605	660	-	-
12	-	-	-	320	540	600	660	720	780	840

MINIMUM SHOULDER TAPER LENGTH = L/3 (feet)										
SHOULDER WIDTH (feet)	25	30	35	40	45	50	55	60	65	70
8'	40	40	60	90	120	130	150	160	170	190
10'	40	60	90	90	150	170	190	200	220	240

USE A MINIMUM 3 DEVICES TAPER FOR SHOULDER LESS THEN 8'.

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

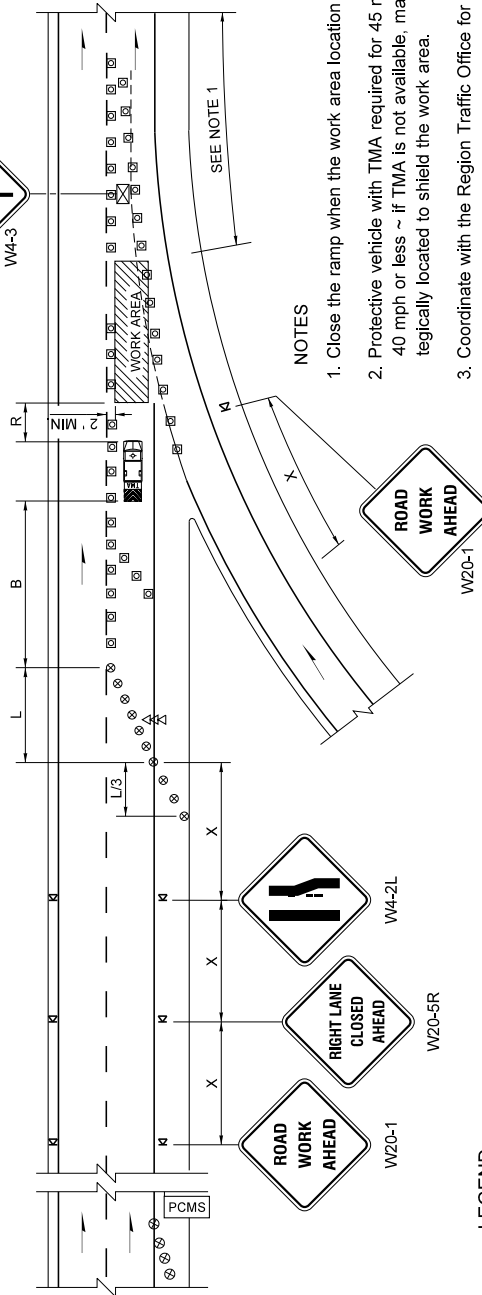
SIGN SPACING = X (FEET) (1)	
FREWAYS & EXPRESSWAYS	55 / 70 MPH 1500±
RURAL HIGHWAYS	60 / 65 MPH 800±
RURAL ROADS	45 / 55 MPH 500± (2)
RURAL ROADS & URBAN ARTERIALS	35 / 40 MPH 350± (2)

ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

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

(2) This spacing may be reduced in urban areas to fit roadway conditions.

CHANNELIZING DEVICE SPACING (FEET)	
MPH	TANGENT
50 / 70	40
40 / 45	30
	60



NOTES

1. Close the ramp when the work area location restricts ramp access.
2. Protective vehicle with TMA required for 45 mph or higher. For roads 40 mph or less ~ if TMA is not available, may be a work vehicle strategically located to shield the work area.
3. Coordinate with the Region Traffic Office for work hour restrictions.
4. Extend the device taper across shoulder.
5. Devices should not encroach into adjacent lanes. The 2' lateral buffer is recommended.
6. Use transverse devices in closed lane every 1000' - when work operation allows.
7. Traffic safety drums or tall channelization devices required for all lane closure tapers on roadways 45 mph or higher. (Half spacing required for tall channelization devices.)

(SAMPLE MESSAGE)

PCMS	
1	2
RIGHT LANE CLOSED AHEAD	1 MILE AHEAD
2.0 SEC	2.0 SEC

FIELD LOCATE 1 MILE ± IN ADVANCE OF LANE CLOSURE TAPER.

LEGEND

- SIGN LOCATION
- ▶▶▶ ARROW BOARD
- ⊗ TRAFFIC SAFETY DRUMS / TALL CHANNELIZATION DEVICES
- ⊠ CHANNELIZING DEVICES
- ⊞ SIGN LOCATION ~ 5' MOUNTING HEIGHT RECOMMENDED
- ⊞ PORTABLE CHANGEABLE MESSAGE SIGN - RECOMMENDED
- ⊞ TMA

TYPICAL TEMPORARY ON-RAMP FOR MULTI-LANE ROADWAYS

TCP 8

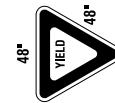
TCP 9 Typical Temporary On-Ramp for Multi-Lane Roadways

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	495	570	645	730
TMA ROLL-AHEAD DISTANCE = R										
HOST VEHICLE WEIGHT 9,500 TO 22,000 lbs.										
< 45 MPH	123'	172'					74'	100'	150'	
45-55 MPH										
> 55 MPH										
45-55 MPH										
> 55 MPH										
PROTECTIVE VEHICLE (WORK VEHICLE) = R										
NO SPECIFIED DISTANCE REQUIRED										

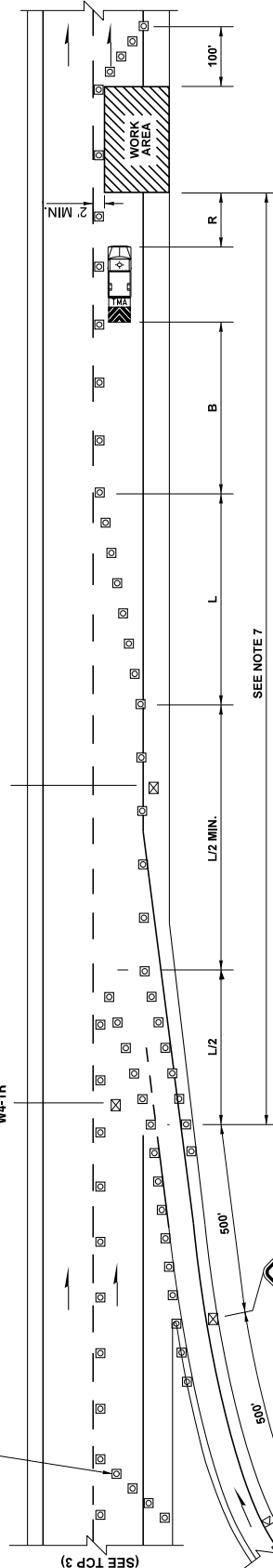
SIGN SPACING = X (FEET)	
FREEWAYS & EXPRESSWAYS	55 / 70 MPH 1500'±
RURAL HIGHWAYS	60 / 65 MPH 800'±
RURAL ROADS	45 / 55 MPH 500'±
RURAL ROADS & URBAN ARTERIALS	35 / 40 MPH 350'±

ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

MINIMUM TAPER LENGTH = L (feet)	
Lane Width (feet)	25 30 35 40 45 50 55 60 65 70
Posted Speed (mph)	- 270 450 500 550 - -
10	- - 295 495 550 605 660 - -
11	- - 320 540 600 660 720 780 840



SEE NOTE 5



CHANNELIZING DEVICE SPACING (FEET)	
MPH	TANGENT
50 / 70	40
40 / 45	30
80	60

MINIMUM SHOULDER TAPER LENGTH = L/3 (feet)	
SHOULDER WIDTH (feet)	Posted Speed (mph)
25	30 35 40 45 50 55 60 65 70
40	40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190
10'	40 60 80 90 95 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240

USE A MINIMUM 3 DEVICES TAPER FOR SHOULDER LESS THEN 8'.
All spacing may be adjusted to accommodate interchange ramps, at-grade intersections, and driveways.

NOTES

- When used, device spacing for the down stream taper should be 20' O. C.
- Protective vehicle with TMA required on roadways 45 mph or higher. On roadways 40 mph or less - may be a work vehicle strategically located to shield work area.
- Devices should not encroach into adjacent lanes. The 2' lateral buffer is recommended.
- Extend device taper across shoulder.
- Use transverse devices in closed lane every 1000'± when work operation allows.
- Traffic safety drums or tall channelization devices required for all lane closure tapers on roadways 45 mph or higher. (Half spacing required for tall channelization devices.)
- Consider short term ramp closure for work in this area.

LEGEND

- ⊠ SIGN LOCATION
- ARROW BOARD
- ⊗ TRAFFIC SAFETY DRUMS
- ⊞ CHANNELIZING DEVICES
- ⊠ SIGN LOCATION (5' MOUNTING HEIGHT RECOMMENDED)
- ⊞ PORTABLE CHANGEABLE MESSAGE SIGN - RECOMMENDED
- TMA

(SAMPLE MESSAGE)

PCMS	
1	2
RIGHT LANE CLOSED	1 MILE AHEAD
2.0 SEC	2.0 SEC

FIELD LOCATE 1 MILE ± IN ADVANCE OF LANE CLOSURE TAPER.

TYPICAL TEMPORARY ON-RAMP FOR MULTI-LANE ROADWAYS TCP 9

TCP 10 Typical Right Lane Closure with Shift – 5 Lane Roadway

SIGN SPACING = X (FEET) (1)		
RURAL ROADS	45 / 55 MPH	500±
RURAL ROADS & URBAN ARTERIALS	35 / 40 MPH	350±
RURAL ROADS, URBAN ARTERIALS RESIDENTIAL & BUSINESS DISTRICTS	25 / 30 MPH	200± (2)

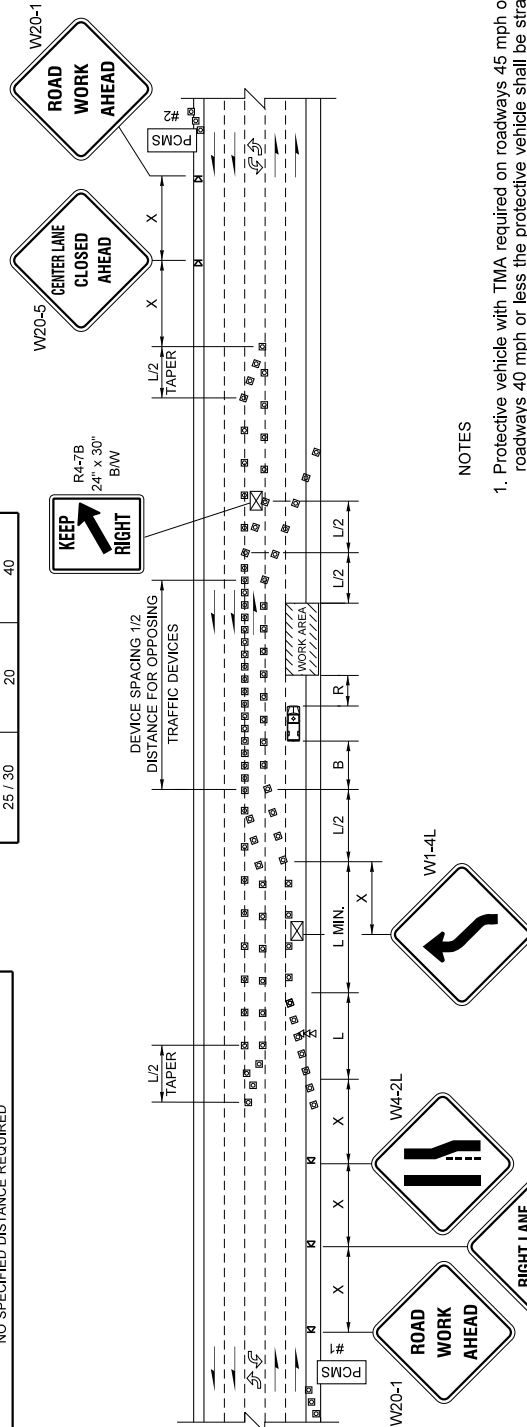
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

MINIMUM TAPER LENGTH = L (feet)	
Lane Width (feet)	Posted Speed (mph)
25	30 35 40 45 50 55 60 65 70
10	105 150 205 270 450 500 - - - -
11	115 165 225 295 495 550 - - - -
12	125 180 245 320 540 600 - - - -

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50	40	80
35 / 45	30	60
25 / 30	20	40

BUFFER DATA	
LONGITUDINAL BUFFER SPACE = B	
SPEED (MPH)	25 30 35 40 45 50 55 60 65 70
LENGTH (feet)	155 200 250 305 360 425 495 570 645 730
TMA ROLL-AHEAD DISTANCE = R	
HOST VEHICLE WEIGHT	> 25,000 lbs.
3,300 TO 22,000 lbs.	> 25,000 lbs.
< 45 MPH	> 55 MPH
123'	172'
45-55 MPH	< 45 MPH
100'	74'
45-55 MPH	> 55 MPH
100'	100'
150'	150'
PROTECTIVE VEHICLE (WORK VEHICLE) = R	
NO SPECIFIED DISTANCE REQUIRED	

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



NOTES

- 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.
- Extend device taper across shoulder if applicable.
- Coordinate with region traffic office for work hour restrictions.
- 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.

(SAMPLE MESSAGE)

PCMS #2	
1	CENTER LANE LEFT CLOSED TURNING
2	NO LEFT TURNING
2.0 SEC	2.0 SEC

FIELD LOCATE IN ADVANCE OF LANE CLOSURE TAPER.

(SAMPLE MESSAGE)

PCMS #1	
1	RIGHT LANES CLOSED
2	MERGE LEFT
2.0 SEC	2.0 SEC

FIELD LOCATE IN ADVANCE OF LANE CLOSURE TAPER.

- LEGEND
- W20-5R SIGN LOCATION
 - W20-5R SIGN LOCATION ~ 5' MOUNTING HEIGHT RECOMMENDED
 - W20-5R ARROW BOARD
 - W20-5R CHANNELIZING DEVICES
 - W20-5R PROTECTIVE VEHICLE - REQUIRED
 - W20-5R PORTABLE CHANGEABLE MESSAGE SIGN - RECOMMENDED

TYPICAL RIGHT LANE CLOSURE WITH SHIFT - 5 LANE ROADWAY
TCP 10

TCP 11 Typical Left Lane and Center Turn Lane Closure – 5 Lane Roadway

Lane Width (feet)	MINIMUM TAPER LENGTH = L (feet)									
	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
10	105	150	205	270	450	500	-	-	-	-
11	115	165	225	295	485	550	-	-	-	-
12	125	180	245	320	540	600	-	-	-	-

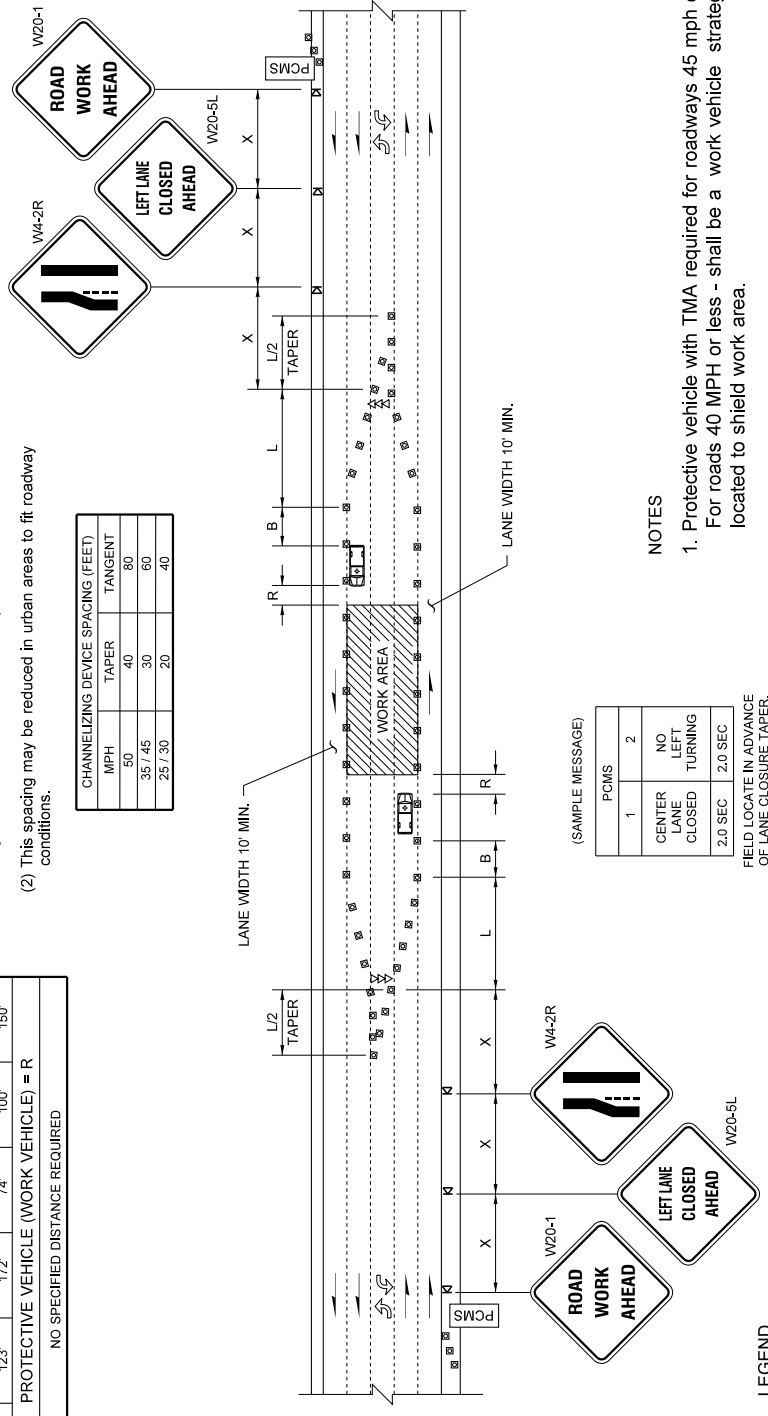
SIGN SPACING = X (FEET) (1)		
RURAL ROADS	45 / 55 MPH	500±
RURAL ROADS & URBAN ARTERIALS	35 / 40 MPH	350±
RURAL ROADS, URBAN ARTERIALS, RESIDENTIAL & BUSINESS DISTRICTS	25 / 30 MPH	200± (2)

ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

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

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50	40	80
55 / 45	30	60
25 / 30	20	40

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	495	570	645	730
TMA ROLL-AHEAD DISTANCE = R										
HOST VEHICLE WEIGHT					HOST VEHICLE WEIGHT					
3,900 TO 22,000 lbs.					> 22,000 lbs.					
< 45 MPH	123'	172'	172'	74'	100'	100'	150'			
PROTECTIVE VEHICLE (WORK VEHICLE) = R										
NO SPECIFIED DISTANCE REQUIRED										



(SAMPLE MESSAGE)

PCMS	
1	2
CENTER LANE CLOSED TURNING	NO LEFT TURNING
2.0 SEC	2.0 SEC

FIELD LOCATE IN ADVANCE OF LANE CLOSURE TAPER.

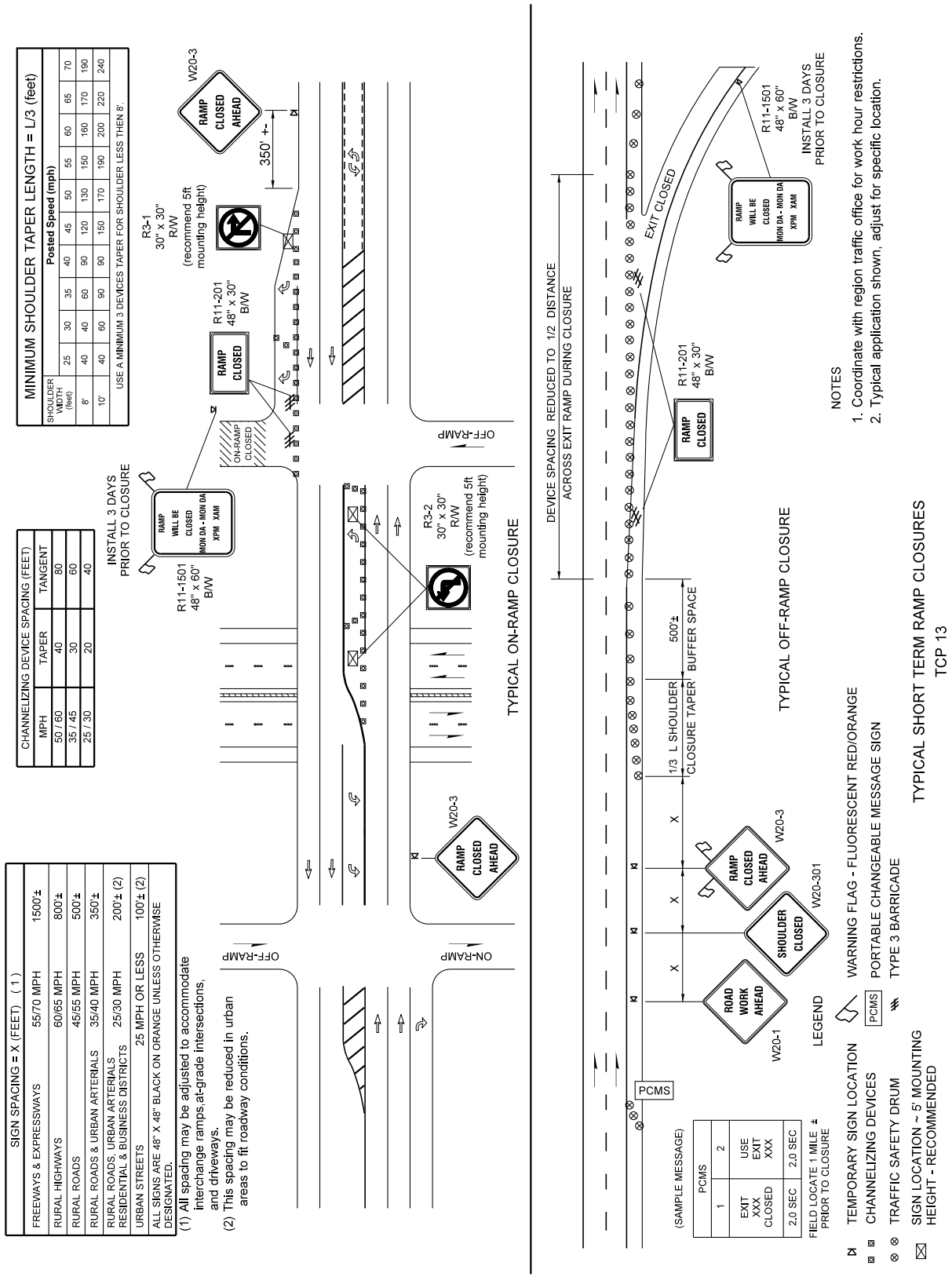
NOTES

- 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.

- LEGEND
- DI SIGN LOCATION
 - DA ARROW BOARD
 - DB CHANNELIZING DEVICES
 - PCMS PROTECTIVE VEHICLE - REQUIRED
 - PCMS PORTABLE CHANGEABLE MESSAGE SIGN - RECOMMENDED

TYPICAL LEFT LANE AND CENTER TURN LANE CLOSURE - 5 LANE ROADWAY
TCP 11

TCP 13 Typical Short-Term Ramp Closures



TCP 15 Typical Intersection Lane Closure – Five-Lane Roadway

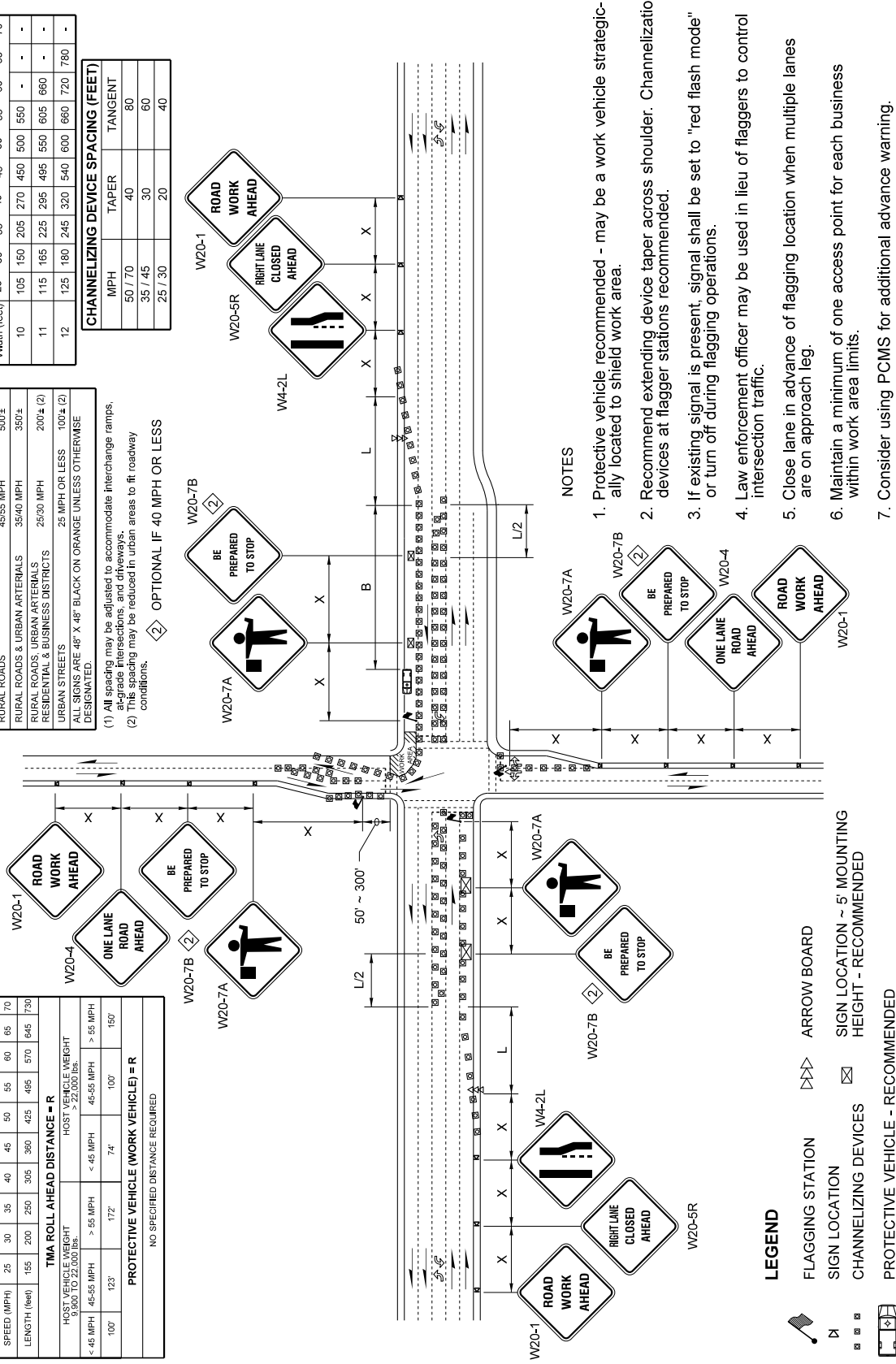
MINIMUM TAPER LENGTH = L (feet)	
Lane Width (feet)	Posted Speed (mph)
25	30
30	35
35	40
40	45
45	50
50	55
55	60
60	65
65	70

SIGN SPACING = X (FEET) (1)	
RURAL HIGHWAYS	60/65 MPH
RURAL ROADS	45/55 MPH
RURAL ROADS & URBAN ARTERIALS	35/40 MPH
RURAL ROADS, URBAN ARTERIALS, RESIDENTIAL & BUSINESS DISTRICTS	25/30 MPH
URBAN STREETS	25 MPH OR LESS

(1) All spacing may be adjusted to accommodate interchange ramps, bridge approaches, and other special conditions.
 (2) This spacing may be reduced in urban areas to fit roadway conditions.

CHANNELIZING DEVICE SPACING (FEET)	
MPH	TAPER
50 / 70	40
35 / 45	30
25 / 30	20
20	40

BUFFER DATA	
LONGITUDINAL BUFFER SPACE = B	
SPEED (MPH)	25 30 35 40 45 50 55 60 65 70
LENGTH (feet)	155 200 250 305 360 425 485 570 645 730
TMA ROLL AHEAD DISTANCE = R	
HOST VEHICLE WEIGHT	9,900 TO 22,000 lbs.
< 45 MPH	> 55 MPH
100'	172'
74'	100'
45-55 MPH	> 55 MPH
100'	150'
PROTECTIVE VEHICLE (WORK VEHICLE) = R	
NO SPECIFIED DISTANCE REQUIRED	



- NOTES**
1. Protective vehicle recommended - may be a work vehicle strategically located to shield work area.
 2. Recommend extending device taper across shoulder. Channelization devices at flagger stations recommended.
 3. If existing signal is present, signal shall be set to "red flash mode" or turn off during flagging operations.
 4. Law enforcement officer may be used in lieu of flaggers to control intersection traffic.
 5. Close lane in advance of flagging location when multiple lanes are on approach leg.
 6. Maintain a minimum of one access point for each business within work area limits.
 7. Consider using PCMS for additional advance warning.

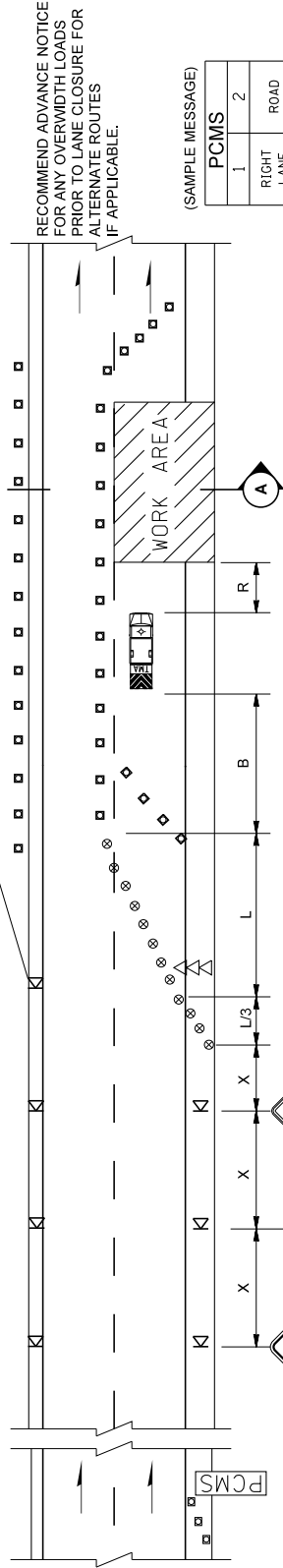
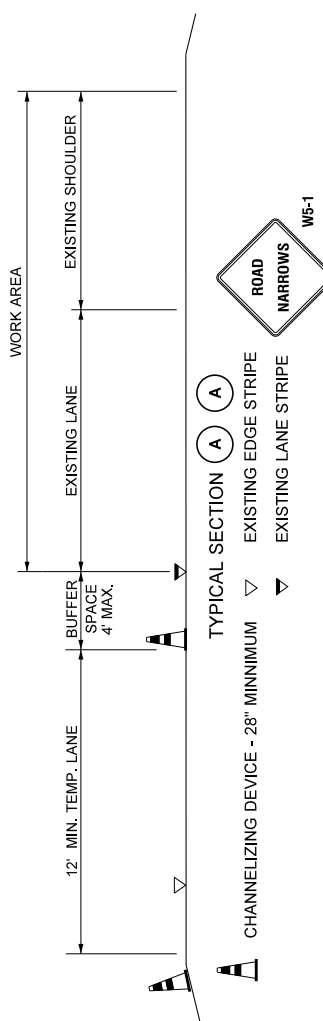
TYPICAL INTERSECTION LANE CLOSURE ~ FIVE LANE ROADWAY
 TCP 15

TCP 16 Typical Single-Lane Closure with Shift

SIGN SPACING = X (feet) (1)			
Freeways & Expressways	55/70 MPH	1500' +-	
Rural Highways	60/65 MPH	800' +-	
Rural Roads	45/55 MPH	500' +-	
Rural Roads & Urban Arterials	35/40 MPH	350' +-	
Rural Roads, Urban Arterials, Residential & Business Districts	25/30 MPH	200' +- (2)	
Urban Streets	25 MPH or LESS	100' +- (2)	

ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

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



(SAMPLE MESSAGE)

PCMS	1	2
RIGHT LANE CLOSED		
ROAD NARROWS		
2+0 SEC. 2+0 SEC.		

Field locate 1 mile +/- in advance of lane closure taper.

CHANNELIZING DEVICE SPACING (FEET)

MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

NOTES

1. If shoulder has existing rumble strips in place, refer to region policy before shifting traffic onto them.
2. TMA is required for roadway 45 mph or higher. For 40 mph or less - protective vehicle shall be strategically placed to shield workers.
3. Traffic safety drums or tall channelization devices required for all lane closure tapers on roadways 45 mph or higher. (Half spacing required for tall channelization devices.)

BUFFER DATA

LONGITUDINAL BUFFER SPACE = B	
SPEED (MPH)	25 30 35 40 45 50 55 60 65 70
LENGTH (feet)	155 200 250 305 360 425 495 570 645 730

TMA ROLL AHEAD DISTANCE = R

HOST VEHICLE WEIGHT	HOST VEHICLE WEIGHT
< 45 MPH	> 22,000 lbs.
45-55 MPH	< 45 MPH
100'	45-55 MPH
123'	> 55 MPH
172'	74'
	100'
	150'

PROTECTIVE VEHICLE (WORK VEHICLE) = R

NO SPECIFIED DISTANCE REQUIRED

MINIMUM SHOULDER TAPER LENGTH = L/3 (feet)

SHOULDER WIDTH (feet)	Posted Speed (mph)
25	30 35 40 45 50 55 60 65 70
8'	40 60 90 120 130 150 160 170 190
10'	40 60 90 90 150 170 190 200 220 240

USE A MINIMUM 3 DEVICES TAPER FOR SHOULDER LESS THEN 8'

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

MINIMUM TAPER LENGTH = L (feet)

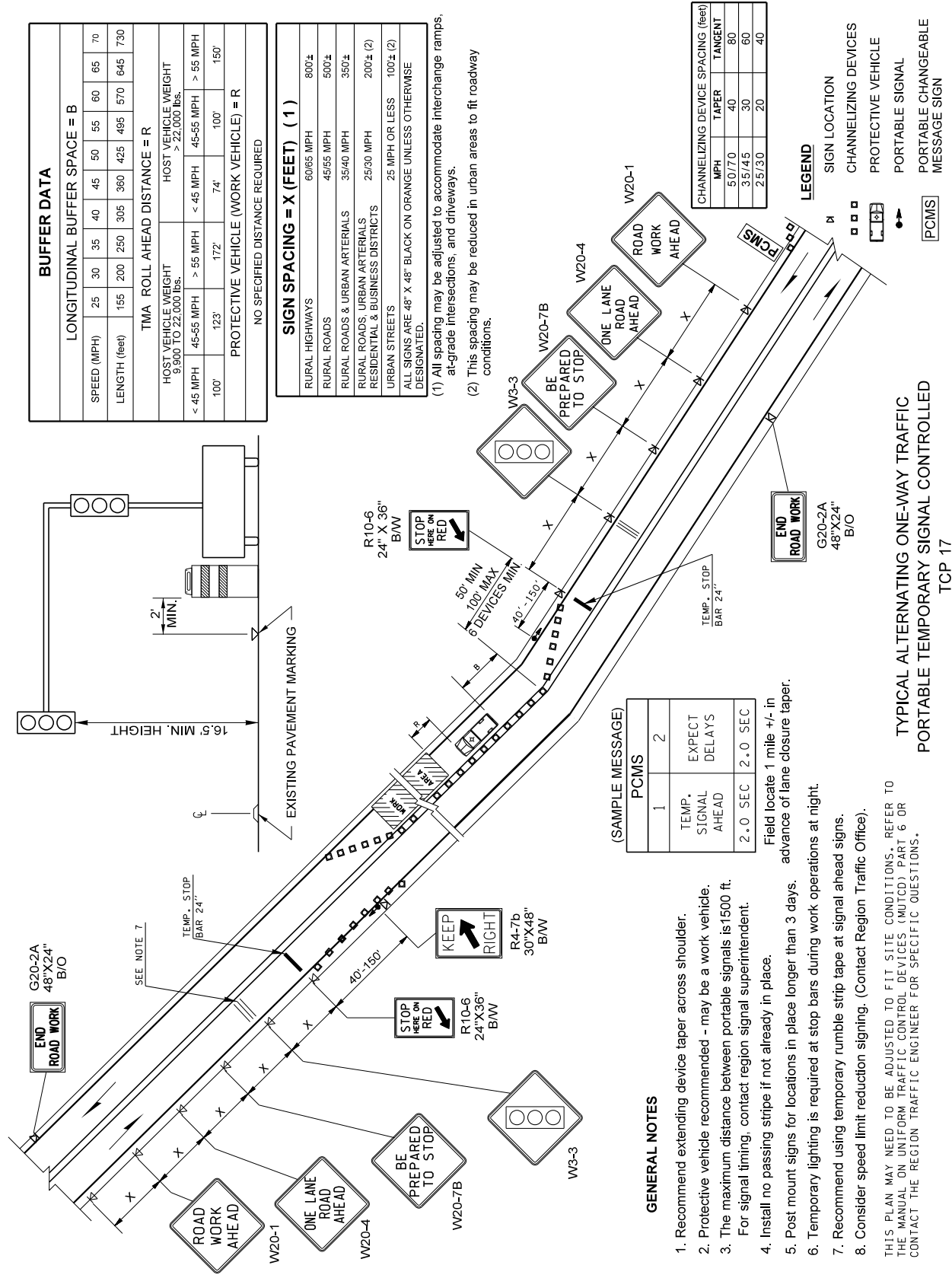
LANE WIDTH + SHIFT	Posted Speed (mph)
14'	25 30 35 40 45 50 55 60 65 70
15'	150 210 230 380 630 700 710 840 910 980
16'	160 230 310 400 680 750 830 900 980 1050
16'	170 240 330 430 720 800 880 960 1040 1120

LEGEND

- ▣ SIGN LOCATION
- ▤ ARROW BOARD
- ▣ CHANNELIZING DEVICES
- ⊗ TRAFFIC SAFETY DRUMS / TALL CHANNELIZATION DEVICES
- ▣ TMA
- ▣ PORTABLE CHANGEABLE MESSAGE SIGN

TYPICAL SINGLE LANE CLOSURE WITH SHIFT
TCP 16

TCP 17 Typical Alternating One-Way Traffic, Portable Temporary Signal Controlled



BUFFER DATA

LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	495	570	645	730

TMA ROLL AHEAD DISTANCE = R

HOST VEHICLE WEIGHT		HOST VEHICLE WEIGHT	
9,900 TO 22,000 lbs.		> 22,000 lbs.	
< 45 MPH	45-55 MPH	> 55 MPH	> 55 MPH
100'	123'	172'	74'
100'	100'	100'	150'

PROTECTIVE VEHICLE (WORK VEHICLE) = R

NO SPECIFIED DISTANCE REQUIRED

SIGN SPACING = X (FEET) (1)

RURAL HIGHWAYS	60/65 MPH	800±
RURAL ROADS	45/55 MPH	500±
RURAL ROADS & URBAN ARTERIALS	35/40 MPH	350±
RURAL ROADS, URBAN ARTERIALS, RESIDENTIAL & BUSINESS DISTRICTS	25/30 MPH	200± (2)
URBAN STREETS	25 MPH OR LESS	100± (2)

ALL SIGNS ARE 48" X 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

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

(2) This spacing may be reduced in urban areas to fit roadway conditions.

CHANNELIZING DEVICE SPACING (feet)

MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

(SAMPLE MESSAGE)

PCMS	1	2
TEMP. SIGNAL AHEAD	2.0 SEC.	2.0 SEC.
EXPECT DELAYS	2.0 SEC.	2.0 SEC.

GENERAL NOTES

1. Recommend extending device taper across shoulder.
2. Protective vehicle recommended - may be a work vehicle.
3. The maximum distance between portable signals is 1500 ft. For signal timing, contact region signal superintendent.
4. Install no passing stripe if not already in place.
5. Post mount signs for locations in place longer than 3 days.
6. Temporary lighting is required at stop bars during work operations at night.
7. Recommend using temporary rumble strip tape at signal ahead signs.
8. Consider speed limit reduction signing. (Contact Region Traffic Office).

THIS PLAN MAY NEED TO BE ADJUSTED TO FIT SITE CONDITIONS. REFER TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) PART 6 OR CONTACT THE REGION TRAFFIC ENGINEER FOR SPECIFIC QUESTIONS.

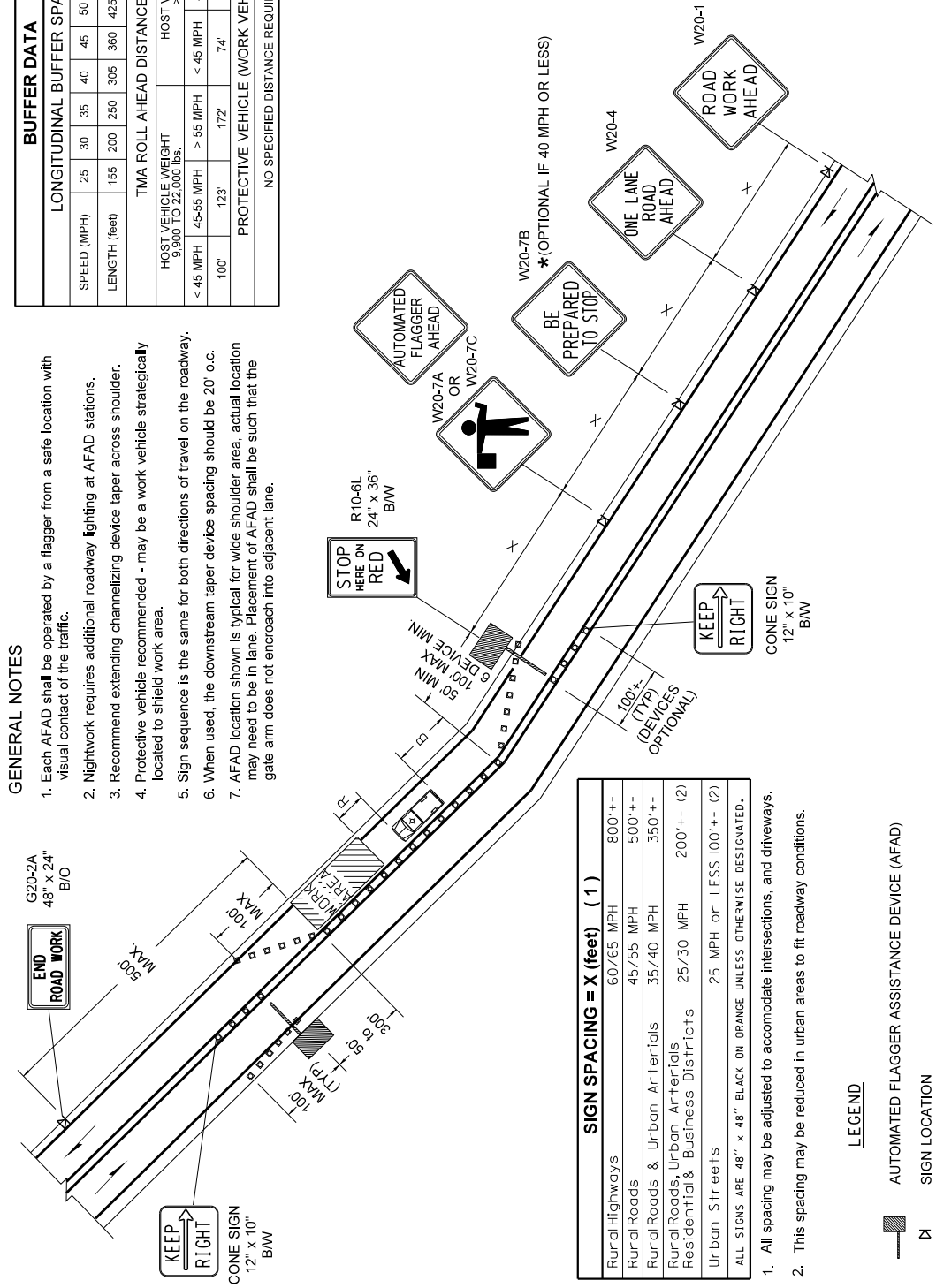
TYPICAL ALTERNATING ONE-WAY TRAFFIC PORTABLE TEMPORARY SIGNAL CONTROLLED

TCP 17

TCP 18 Typical Alternating One-Way Traffic with AFAD

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	485	570	645	730
TMA ROLL AHEAD DISTANCE = R										
HOST VEHICLE WEIGHT	HOST VEHICLE WEIGHT									
9,300 TO 22,000 lbs.	> 22,000 lbs.									
< 45 MPH	45-55 MPH	> 55 MPH	< 45 MPH	> 55 MPH	> 55 MPH	> 55 MPH	> 55 MPH	> 55 MPH	> 55 MPH	> 55 MPH
100'	123'	172'	74'	100'	100'	150'	150'	150'	150'	150'
PROTECTIVE VEHICLE (WORK VEHICLE) = R										
NO SPECIFIED DISTANCE REQUIRED										

- GENERAL NOTES**
- Each AFAD shall be operated by a flagger from a safe location with visual contact of the traffic.
 - Nightwork requires additional roadway lighting at AFAD stations.
 - Recommend extending channelizing device taper across shoulder.
 - Protective vehicle recommended - may be a work vehicle strategically located to shield work area.
 - Sign sequence is the same for both directions of travel on the roadway.
 - When used, the downstream taper device spacing should be 20' o.c.
 - 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.



- LEGEND**
- AUTOMATED FLAGGER ASSISTANCE DEVICE (AFAD)
 - SIGN LOCATION
 - CHANNELIZING DEVICES
 - PROTECTIVE VEHICLE - RECOMMENDED

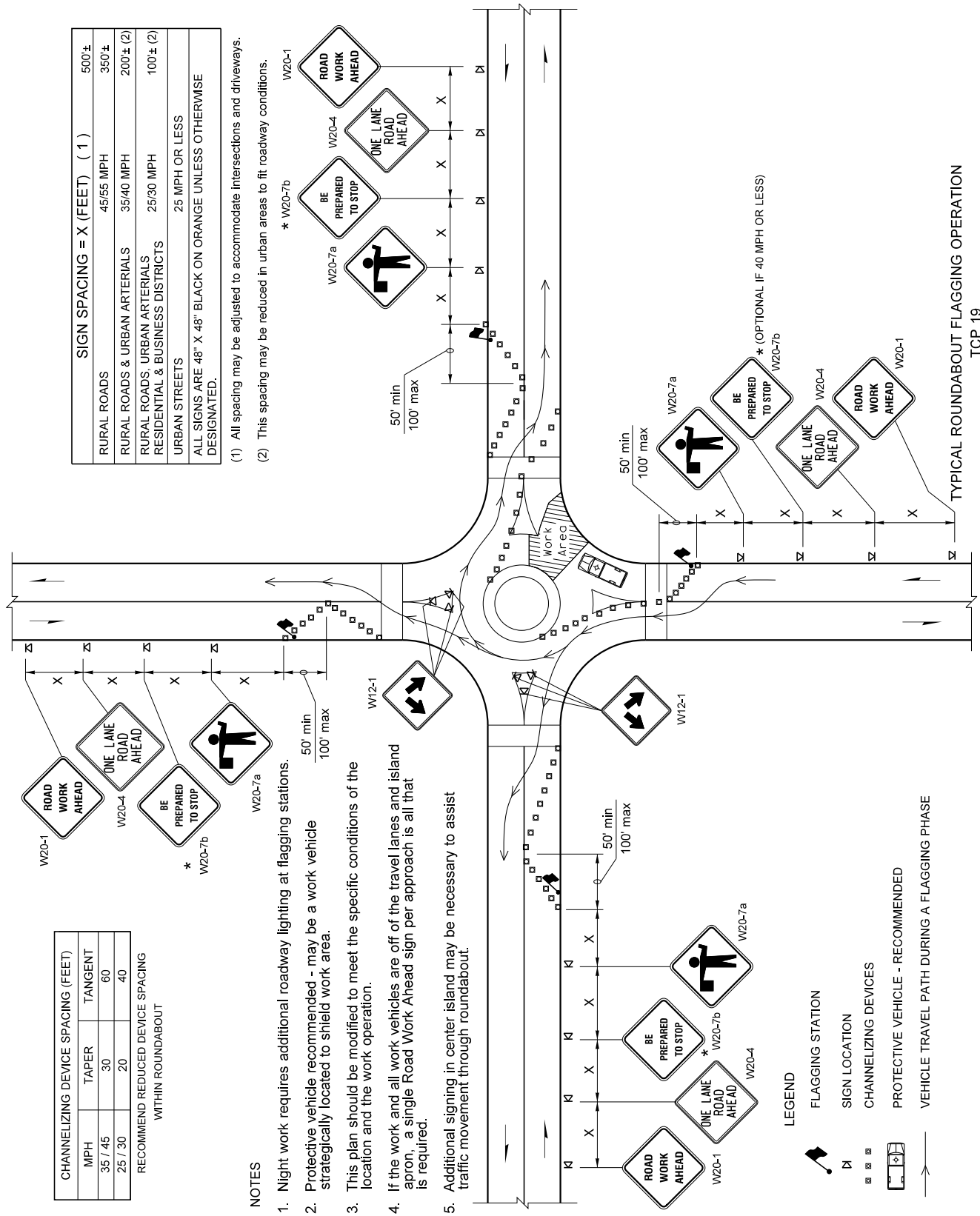
TYPICAL ALTERNATING ONE-WAY TRAFFIC WITH AUTOMATED FLAGGER ASSISTANCE DEVICES TCP 18

TCP 19 Typical Roundabout Flagging Operation

SIGN SPACING = X (FEET) (1)		
RURAL ROADS	45/55 MPH	500±
RURAL ROADS & URBAN ARTERIALS	35/40 MPH	350±
RURAL ROADS, URBAN ARTERIALS RESIDENTIAL & BUSINESS DISTRICTS	25/30 MPH	200± (2)
URBAN STREETS	25 MPH OR LESS	100± (2)

ALL SIGNS ARE 48" X 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

- (1) All spacing may be adjusted to accommodate intersections and driveways.
- (2) This spacing may be reduced in urban areas to fit roadway conditions.



CHANNELIZING DEVICE SPACING (FEET)	
MPH	TANGENT
35 / 45	30
25 / 30	20

RECOMMEND REDUCED DEVICE SPACING WITHIN ROUNDABOUT

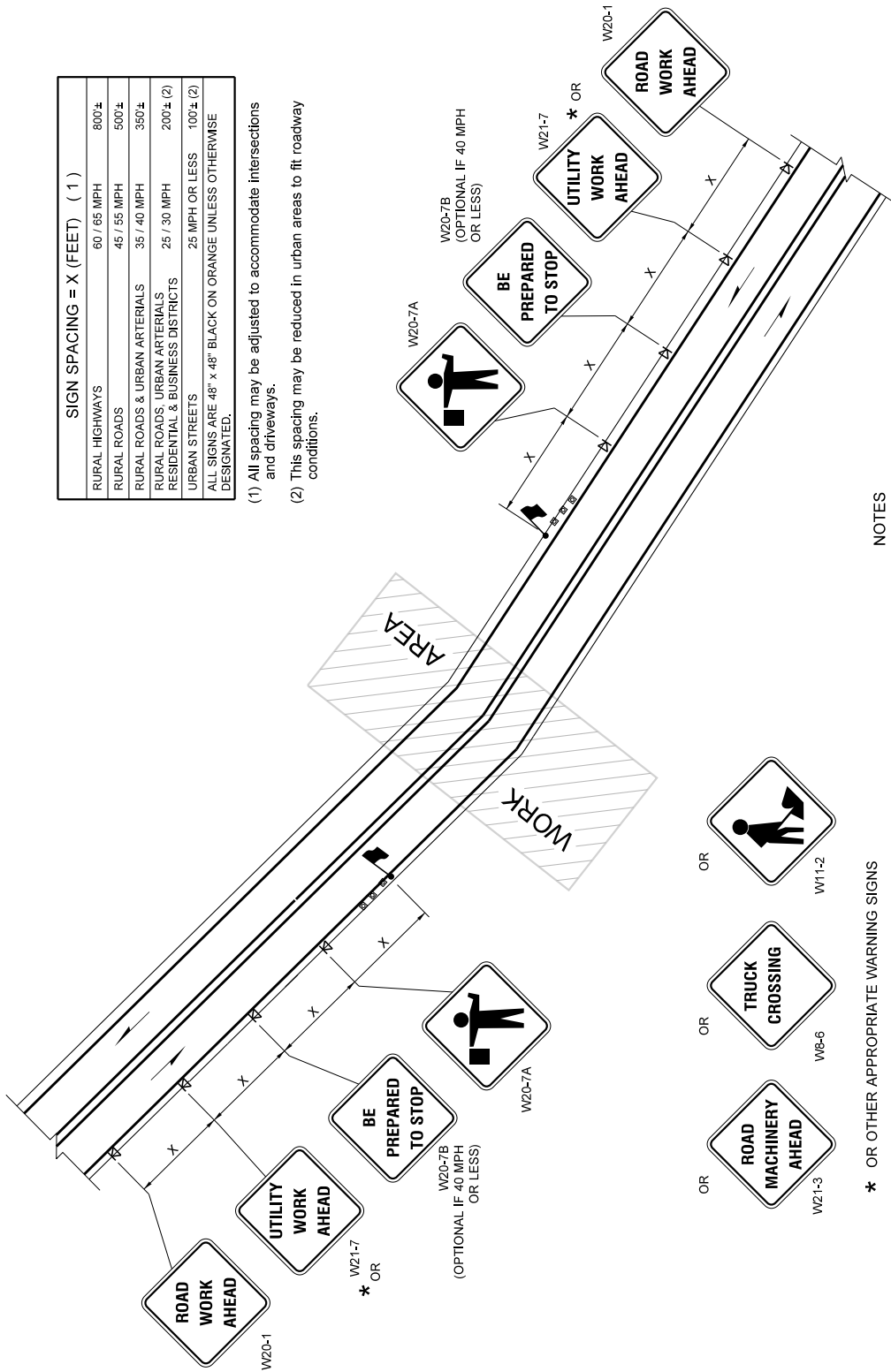
- NOTES**
1. Night work requires additional roadway lighting at flagging stations.
 2. Protective vehicle recommended - may be a work vehicle strategically located to shield work area.
 3. This plan should be modified to meet the specific conditions of the location and the work operation.
 4. If the work and all work vehicles are off of 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.

TYPICAL ROUNDABOUT FLAGGING OPERATION
TCP 19

TCP 20 Short Term Traffic Stop with Flaggers

SIGN SPACING = X (FEET) (1)		
RURAL HIGHWAYS	60 / 65 MPH	800±
RURAL ROADS	45 / 55 MPH	500±
RURAL ROADS & URBAN ARTERIALS	35 / 40 MPH	350±
RURAL ROADS, URBAN ARTERIALS RESIDENTIAL & BUSINESS DISTRICTS	25 / 30 MPH	200± (2)
URBAN STREETS	25 MPH OR LESS	100± (2)
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

- (1) All spacing may be adjusted to accommodate intersections and driveways.
- (2) This spacing may be reduced in urban areas to fit roadway conditions.



- 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.

- LEGEND**
- FLAGGING STATION - RECOMMENDED
 - SIGN LOCATION
 - CHANNELIZING DEVICES (OPTIONAL)

TYPICAL SHORT TERM TRAFFIC STOP WITH FLAGGERS
TCP 20

TCP 21 Outside Lane Closures – Five-Lane Roadway

Lane Width (feet)	MINIMUM TAPER LENGTH = L (feet)											
	Posted Speed (mph)											
10	25	30	35	40	45	50	55	60	65	70	-	-
11	105	150	205	270	450	500	-	-	-	-	-	-
12	115	165	225	295	495	550	-	-	-	-	-	-

SIGN SPACING = X (FEET) (1)			
RURAL ROADS	45 / 55 MPH	500 ±	
RURAL ROADS & URBAN ARTERIALS	35 / 40 MPH	350 ±	
RURAL ROADS, URBAN ARTERIALS RESIDENTIAL & BUSINESS DISTRICTS	25 / 30 MPH	200 ± (2)	

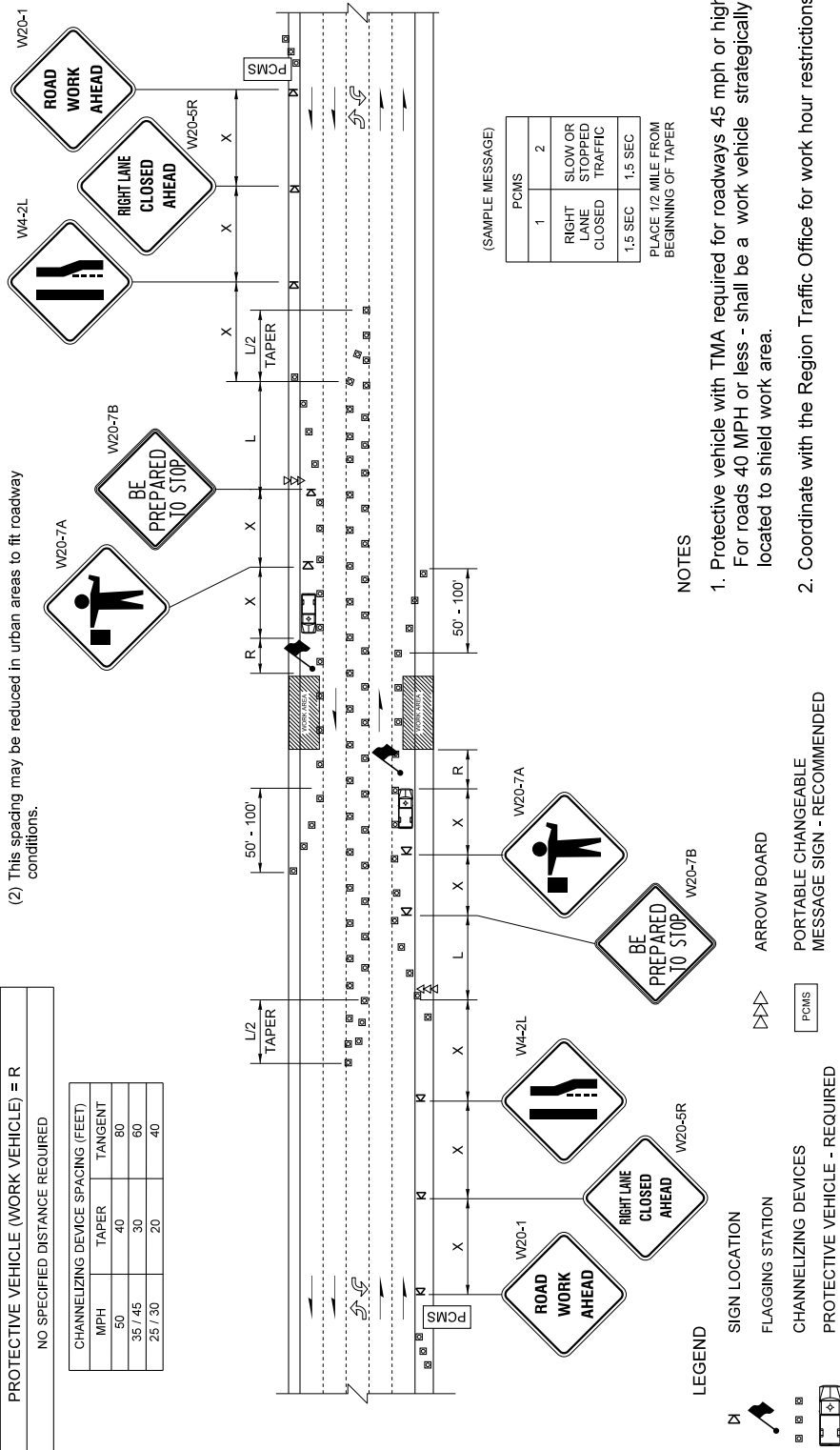
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

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

(2) This spacing may be reduced in urban areas to fit roadway conditions.

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	495	570	645	730
TMA ROLL AHEAD DISTANCE = R										
HOST VEHICLE WEIGHT										
9,900 TO 22,000 lbs.										
< 45 MPH	172'	172'	172'	172'	172'	172'	172'	172'	172'	172'
45-55 MPH	172'	172'	172'	172'	172'	172'	172'	172'	172'	172'
> 55 MPH	100'	100'	100'	100'	100'	100'	100'	100'	100'	150'

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50	40	80
35 / 45	30	60
25 / 30	20	40



NOTES

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.

OUTSIDE LANE CLOSURES - FIVE LANE ROADWAY
TCP 21

TCP 22 Typical Lane Shift with Two Way Left Turn Lane

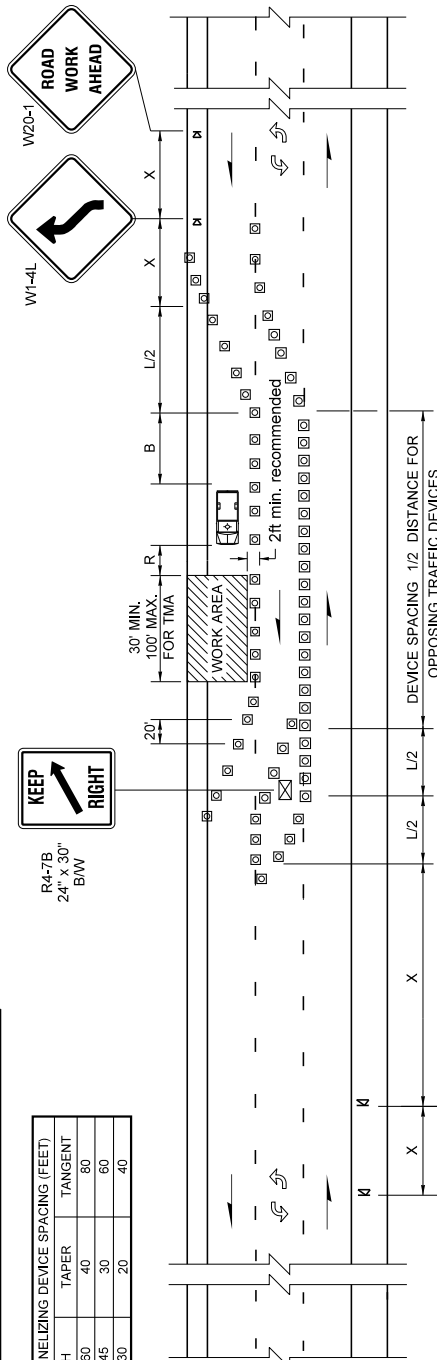
SIGN SPACING = X (FEET) (1)	
RURAL HIGHWAYS	60/65 MPH 800±
RURAL ROADS	45/55 MPH 500±
RURAL ROADS & URBAN ARTERIALS	35/40 MPH 350±
RESIDENTIAL & BUSINESS DISTRICTS	25/30 MPH 200± (2)
URBAN STREETS	25 MPH OR LESS 100± (2)

MINIMUM TAPER LENGTH = L (feet)										
Lane Width (feet)	Posted Speed (mph)									
		25	30	35	40	45	50	55	60	65
10	105	150	205	270	450	500	550	-	-	-
11	115	165	225	295	495	550	605	660	-	-
12	125	180	245	320	540	600	660	720	-	-

BUFFER DATA	
LONGITUDINAL BUFFER SPACE = B	
SPEED (MPH)	25 30 35 40 45 50 55 60 65 70
LENGTH (feet)	155 200 250 305 360 425 495 570 645 730
TMA ROLL AHEAD DISTANCE = R	
HOST VEHICLE WEIGHT	
9,900 TO 22,000 lbs.	
< 45 MPH	> 55 MPH
123'	172'
PROTECTIVE VEHICLE (WORK VEHICLE) = R	
NO SPECIFIED DISTANCE REQUIRED	

CHANNELIZING DEVICE SPACING (FEET)	
MPH	TAPER TANGENT
50 / 60	40 80
35 / 45	30 60
25 / 30	20 40

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



NOTES

- For long term projects, conflicting pavement markings no longer applicable must be removed or obliterated as soon as practicable. Temporary markings shall be used as necessary and signs shall be post mounted.
- For speed limits of 30 mph or less, use sign W1-3 in lieu of sign W1-4.
- Extend device taper across shoulder if applicable.
- Protective vehicle with TMA required for roadways 45 mph or higher. For roads 40 mph or less - shall be a work vehicle placed strategically to shield 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 22

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 23** ***Typical Short Duration Shoulder Work (Multi-Lane Application)***
(Encroachment into the adjacent live lane or the vertical clearance above the live lane is not allowed with this plan.)
- TCP 24** ***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 25** ***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 26** ***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 27** ***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 28** ***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 29** ***Typical Very Short Duration Work Operation (Intersection Application)***

TCP 23 Typical Short Duration Shoulder Work (Multi-Lane Application)

STATIONARY TMA ROLL AHEAD DISTANCE = R		
HOST VEHICLE WEIGHT		
9,900 TO 22,000 lbs.		
< 45 MPH	45-55 MPH	> 55 MPH
100'	123'	172'
		74'
		100'
		150'
PROTECTIVE VEHICLE (WORK VEHICLE) = R		
NO SPECIFIED DISTANCE REQUIRED		

SIGHT DISTANCE DATA										
MINIMUM STOPPING SIGHT DISTANCE = S										
SPEED LIMIT MPH	25	30	35	40	45	50	55	60	65	70
DISTANCE FEET	155	200	250	305	360	425	495	570	645	730

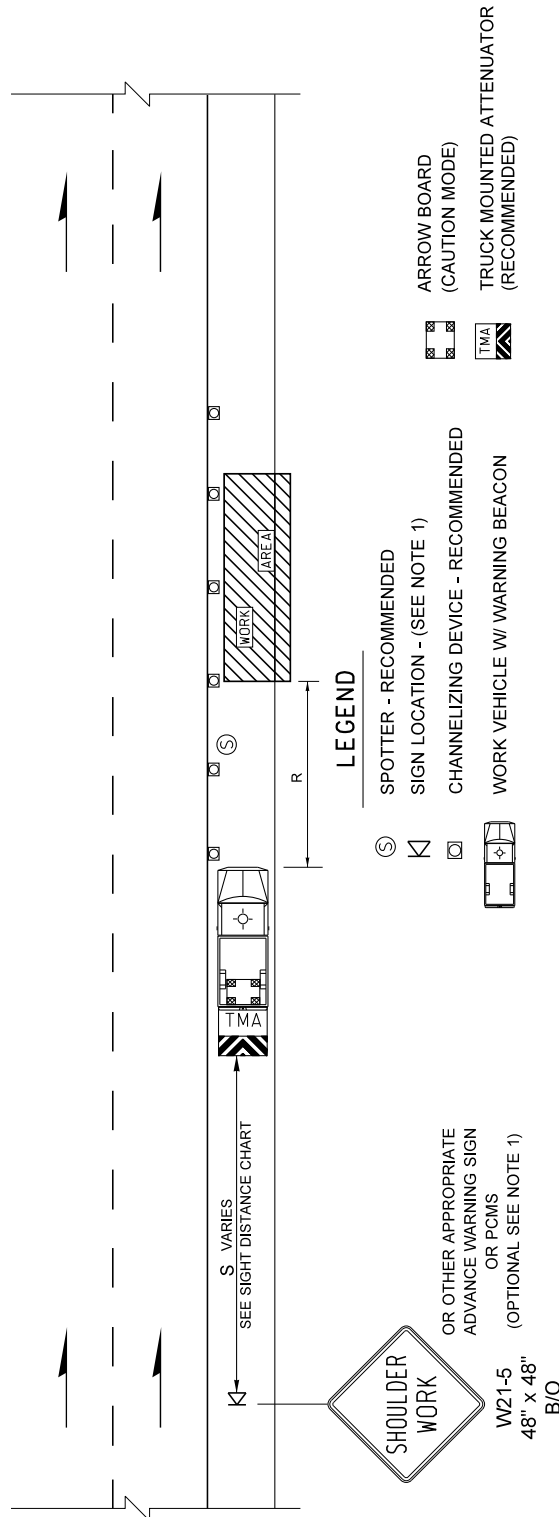
DISTANCES SHOWN ARE MINIMUMS, USE ADDITIONAL DISTANCE WHEN POSSIBLE.

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.

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.

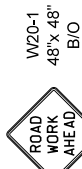


TYPICAL SHORT DURATION SHOULDER WORK (MULTI-LANE APPLICATION) TCP 23

TCP 24 Typical Short Duration Work Operation (Intersection Application)

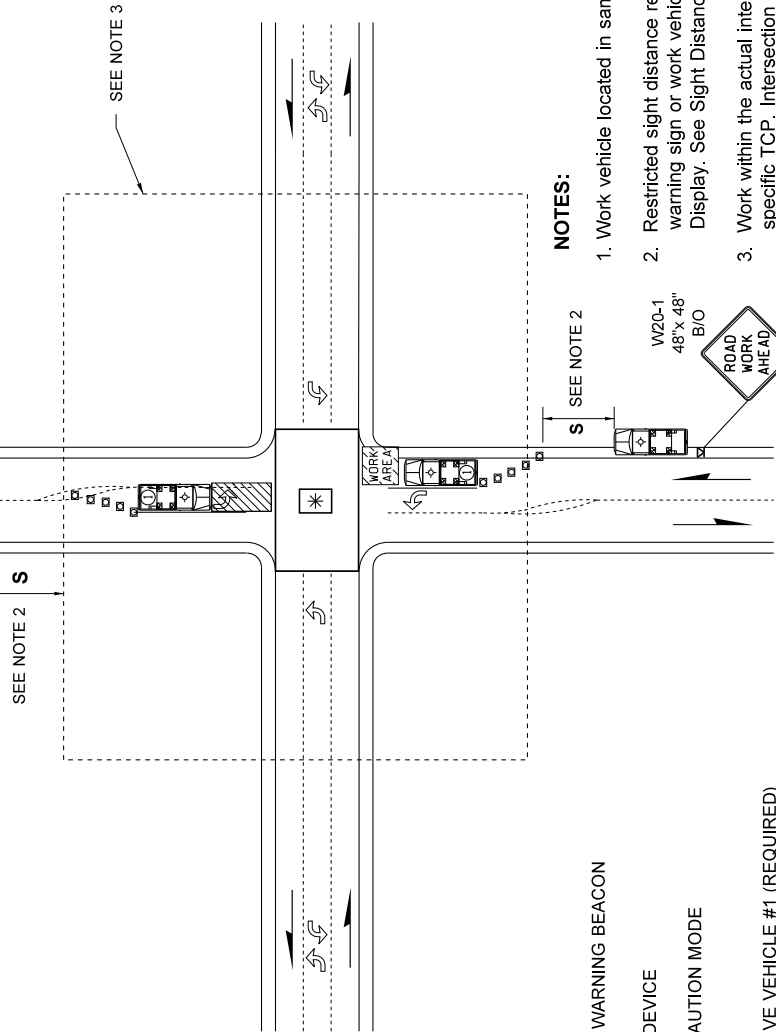
SIGHT DISTANCE DATA										
MINIMUM STOPPING SIGHT DISTANCE = S										
SPEED LIMIT MPH	25	30	35	40	45	50	55	60	65	70
DISTANCE FEET	155	200	250	305	360	425	495	570	645	730

DISTANCES SHOWN ARE MINIMUMS, USE ADDITIONAL DISTANCE WHEN POSSIBLE.



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.



LEGEND

- WORK VEHICLE W/ WARNING BEACON
- CHANNELIZATION DEVICE
- ARROW BOARD- CAUTION MODE
- SIGN LOCATION
- WORK / PROTECTIVE VEHICLE #1 (REQUIRED)

NOTES:

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

TYPICAL SHORT DURATION WORK OPERATION
(INTERSECTION APPLICATION)
(SEE GUIDANCE TEXT FOR ADDITIONAL DIRECTION)
TCP 24

TCP 25 Typical Very Short Duration Work Operation (Outside Traveled Way)

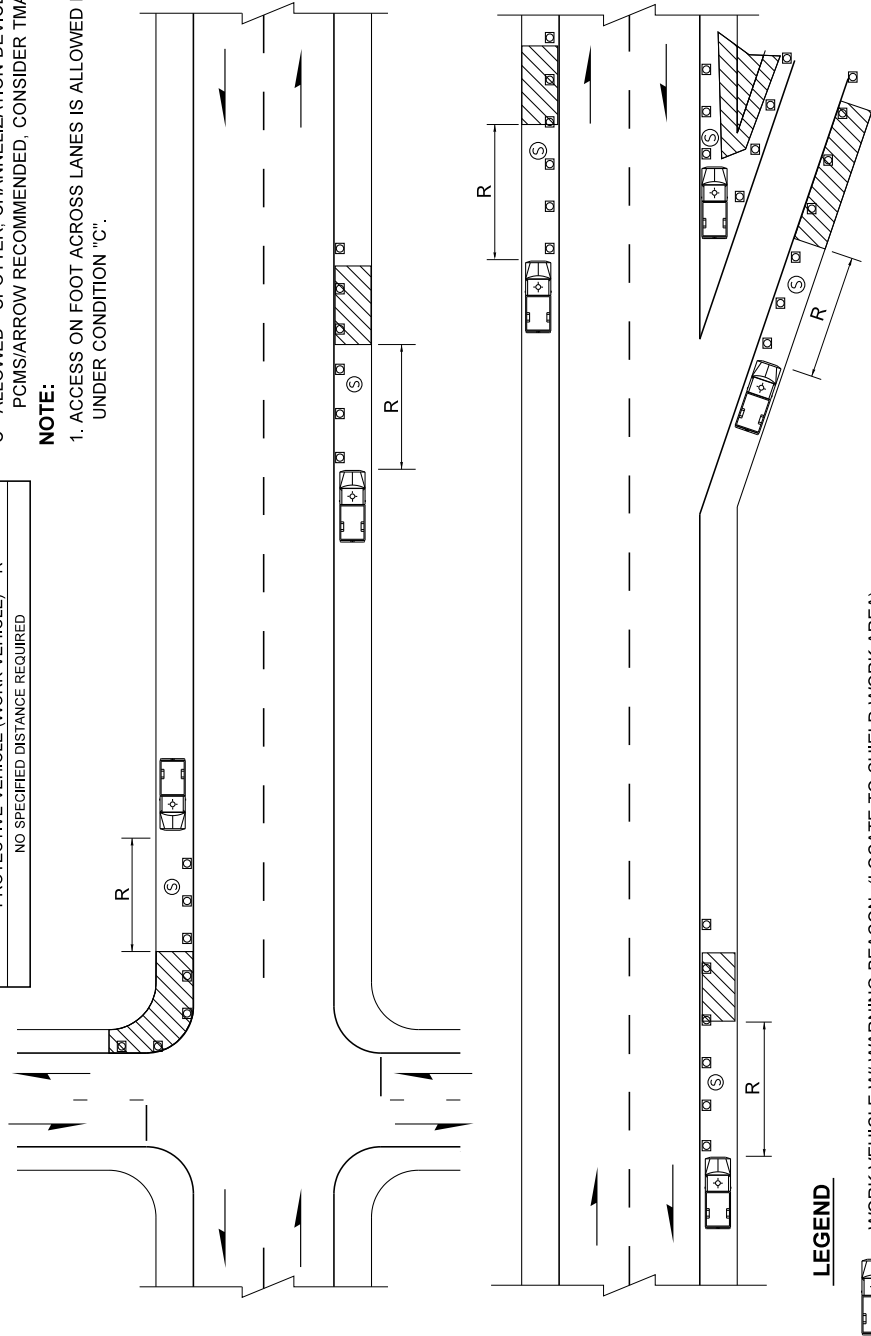
WORK ZONE CONDITION (SEE CHAPTER 1.9.10)

- 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.

NOTE:

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

STATIONARY TMA ROLL AHEAD DISTANCE = R			
HOST VEHICLE WEIGHT		HOST VEHICLE WEIGHT	
9,900 TO 22,000 lbs.		> 22,000 lbs.	
< 45 MPH	45-55 MPH	> 55 MPH	> 55 MPH
100'	123'	172'	150'
		74'	100'
PROTECTIVE VEHICLE (WORK VEHICLE) = R			
NO SPECIFIED DISTANCE REQUIRED			



LEGEND

- WORK VEHICLE W/ WARNING BEACON (LOCATE TO SHIELD WORK AREA)
- SPOTTER - RECOMMENDED
- WORK AREA
- CHANNELIZING DEVICES - RECOMMENDED
- TYPICAL VERY SHORT DURATION WORK OPERATION (OUTSIDE TRAVELED WAY) (HIGH OR LOW SPEED SHOULDER WORK, MEDIAN, GORE, RAMP SHOULDER, ETC.)

TCP 25

TCP 26 Typical Very Short Duration Work Operation (Multi-Lane Application, Low Speed, 40 mph or Lower)

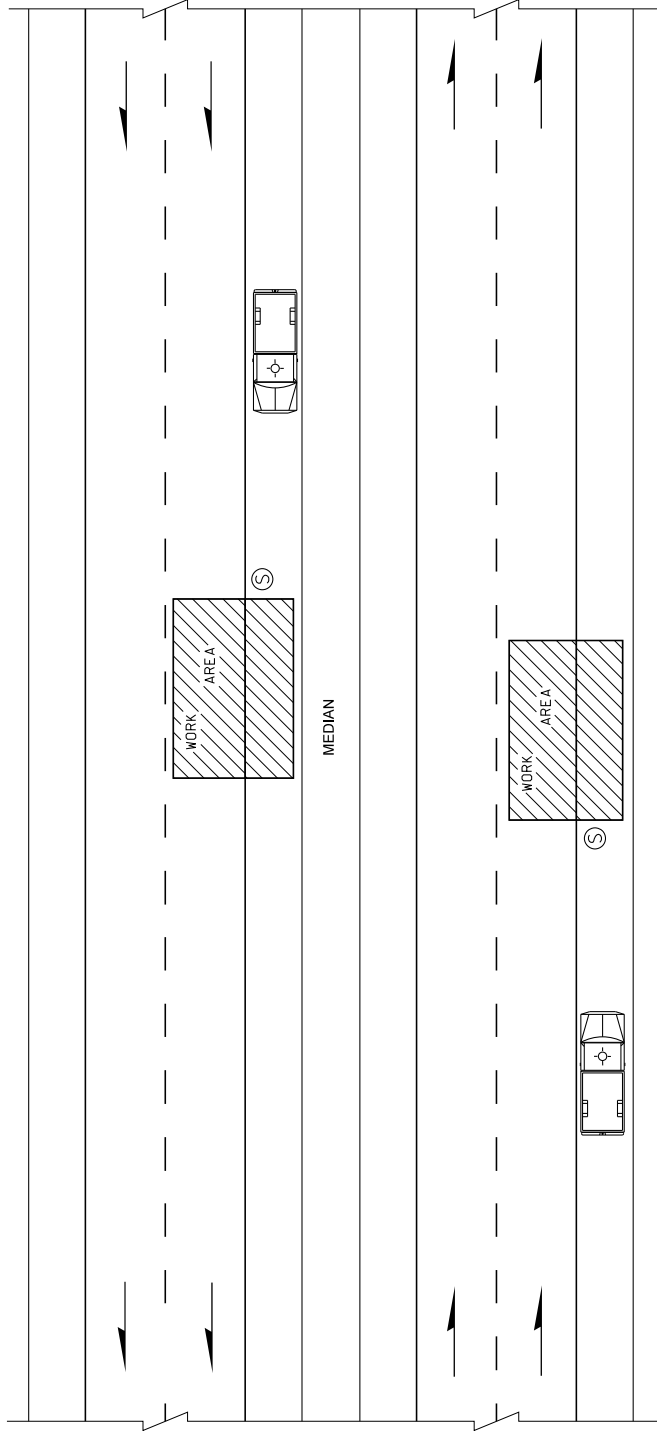
SIGHT DISTANCE DATA

MINIMUM STOPPING SIGHT DISTANCE = S		25	30	35	40	45	50	55	60	65	70
SPEED LIMIT	MPH										
DISTANCE	FEET	155	200	250	305	360	425	495	570	645	730

DISTANCES SHOWN ARE MINIMUMS. USE ADDITIONAL DISTANCE WHEN POSSIBLE.

WORK ZONE CONDITION (SEE CHAPTER 1.9.10)

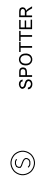
- A - ALLOWED - CONSIDER USING A SPOTTER
- B - ALLOWED - SPOTTER REQUIRED FOR WORKER ACCESS TO LANE.
- C - NOT RECOMMENDED, SEE TCP 24 FOR WORK ZONE REQUIREMENTS.



NOTES:

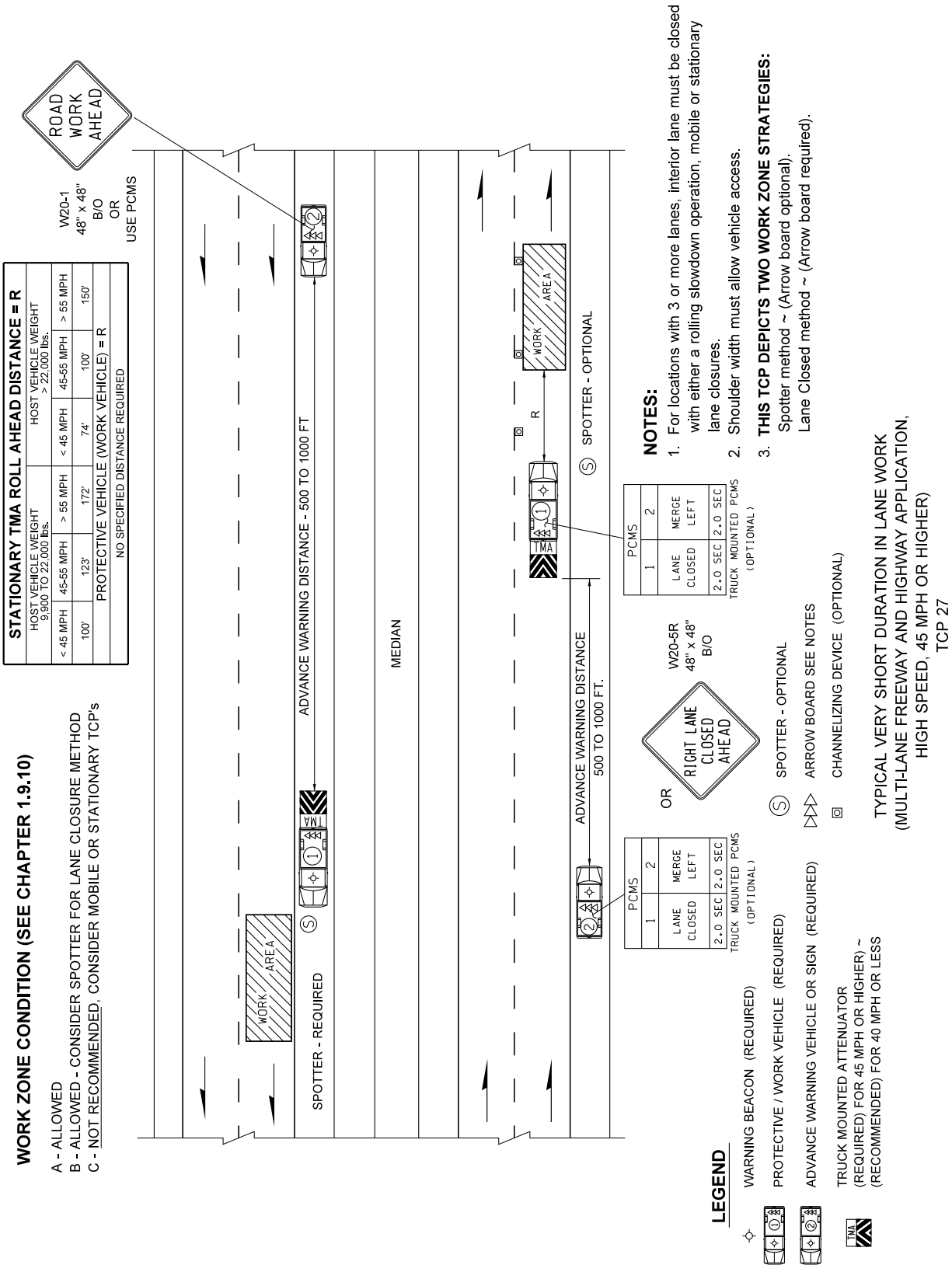
1. SEE CHAPTER 1.9.11, SECTION 6.
2. RESTRICTED SIGHT DISTANCE REQUIRES ADDITIONAL ADVANCE WARNING DEVICES OR SIGNS, SEE SIGHT DISTANCE CHART.

LEGEND



TYPICAL VERY SHORT DURATION WORK OPERATION
(MULTI-LANE APPLICATION, LOW SPEED 40 MPH OR LOWER)
(SEE GUIDANCE TEXT FOR ADDITIONAL DIRECTION)
TCP 26

TCP 27 Typical Very Short Duration In-lane Work (Multi-Lane Freeway)



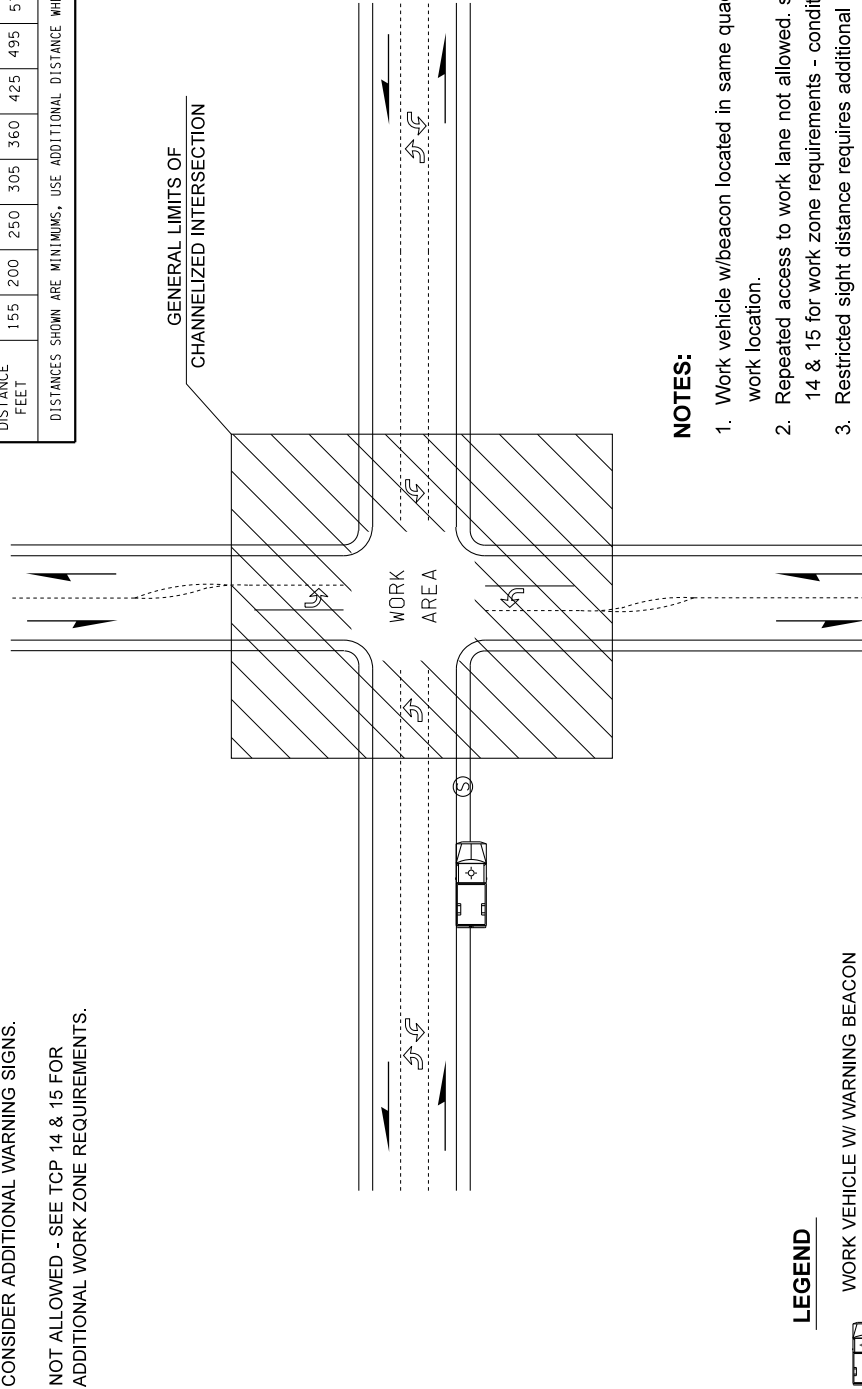
TCP 29 Typical Very Short Duration Work Operation (Intersection Application)

WORK ZONE CONDITION (SEE CHAPTER 1.9.10)

- A - ALLOWED - CONSIDER USING A SPOTTER.
- B - ALLOWED - SPOTTER RECOMMENDED CONSIDER ADDITIONAL WARNING SIGNS.
- C - NOT ALLOWED - SEE TCP 14 & 15 FOR ADDITIONAL WORK ZONE REQUIREMENTS.

SIGHT DISTANCE DATA										
MINIMUM STOPPING SIGHT DISTANCE = S										
SPEED LIMIT MPH	25	30	35	40	45	50	55	60	65	70
DISTANCE FEET	155	200	250	305	360	425	495	570	645	730

DISTANCES SHOWN ARE MINIMUMS, USE ADDITIONAL DISTANCE WHEN POSSIBLE.



LEGEND

- WORK VEHICLE W/ WARNING BEACON (LOCATE TO SHIELD WORK VEHICLE)
- SPOTTER

NOTES:

1. Work vehicle w/beacon located in same quadrant as work location.
2. Repeated access to work lane not allowed. see tcp 14 & 15 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 red phase if signalized.
5. See **chapter 1.9.10 - 1.9.11** for additional direction .

TYPICAL VERY SHORT DURATION WORK OPERATION (INTERSECTION APPLICATION) TCP 29

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.

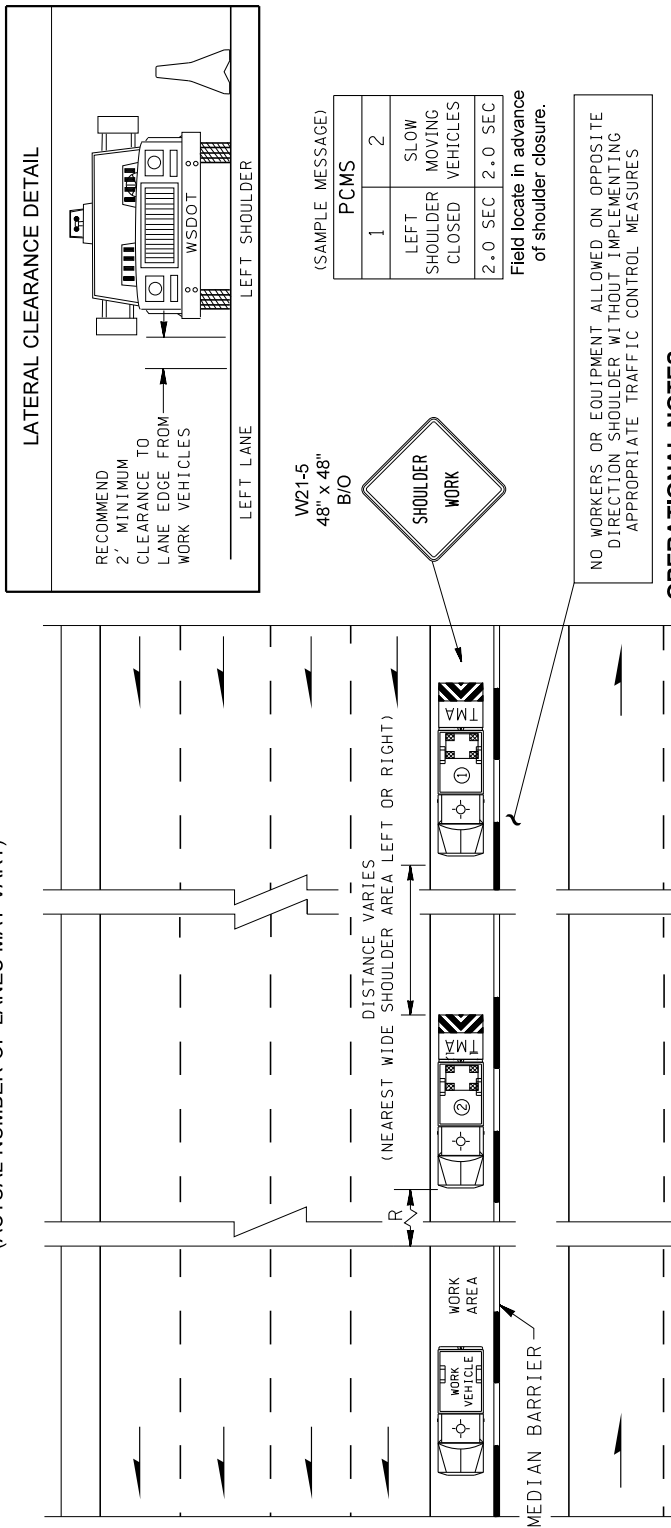
Mobile work zones are well suited to many maintenance operations and can be an efficient way to accomplish many types of work, but due to the moving nature of these operations and lack of channelization devices when closing a lane, careful consideration of traffic and roadway conditions as they relate 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 30 *Typical Mobile Freeway Operation, Left Shoulder Closed***
(For work operations that can be accomplished on the shoulder without encroachment into the adjacent lanes.)
- TCP 31 *Typical Mobile Freeway Operation, Left Lane Closed***
(For work operations on the left shoulder or in the lane.)
- TCP 32 *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 33 *Typical Mobile Operation, Two Lane Roadway Lane Closure***
(For mobile operations on a rural two-lane, two-way roadway with “in lane” work.)
- TCP 34 *Typical Mobile Operation, Two Lane Roadway Shoulder Closure***
(For mobile operations on a rural two-lane, two-way roadway with no encroachment.)

TCP 30 Typical Mobile Freeway Operation Left Shoulder Closed

TYPICAL FREEWAY APPLICATION
(ACTUAL NUMBER OF LANES MAY VARY)



(SAMPLE MESSAGE)

PCMS	
1	2
LEFT SHOULDER CLOSED	SLOW MOVING VEHICLES
2.0 SEC	2.0 SEC

Field locate in advance of shoulder closure.

OPERATIONAL NOTES

- Shadow vehicle #1, mount shoulder closure sign on back of vehicle or use truck mounted VMS. Do not obscure arrow board. maintain 1000' to 1500' of sight distance to approaching traffic (TMA recommended)
- Use of advance warning vehicle should be considered when all work remains within a vehicle or forward of the work vehicle, required when behind the work vehicle.
- Protective vehicle #2, position vehicle to provide protection of crew. Maintain roll-ahead distance. (TMA recommended).
- Use a mobile lane closure if lane encroachment is necessary.
- Contact Region Traffic Management center prior to work begin and end.
- 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.
- PCMS recommended.

MOBILE TMA ROLL AHEAD DISTANCE = R			
HOST VEHICLE WEIGHT 9,900 TO 22,000 lbs.	HOST VEHICLE WEIGHT > 22,000 lbs.		
< 45 MPH	> 55 MPH	< 45 MPH	> 55 MPH
100'	172'	45-55 MPH	150'
		100'	172'
PROTECTIVE VEHICLE (WORK VEHICLE) = R			
NO SPECIFIED DISTANCE REQUIRED			

LEGEND



ARROW BOARD TYPE "B"
(CAUTION MODE)



TRUCK MOUNTED ATTENUATOR



VEHICLE WITH WARNING BEACON (REQUIRED)

TYPICAL MOBILE FREEWAY OPERATION
LEFT SHOULDER CLOSED
TCP 30

TCP 31 Typical Mobile Freeway Operation Left Lane Closure

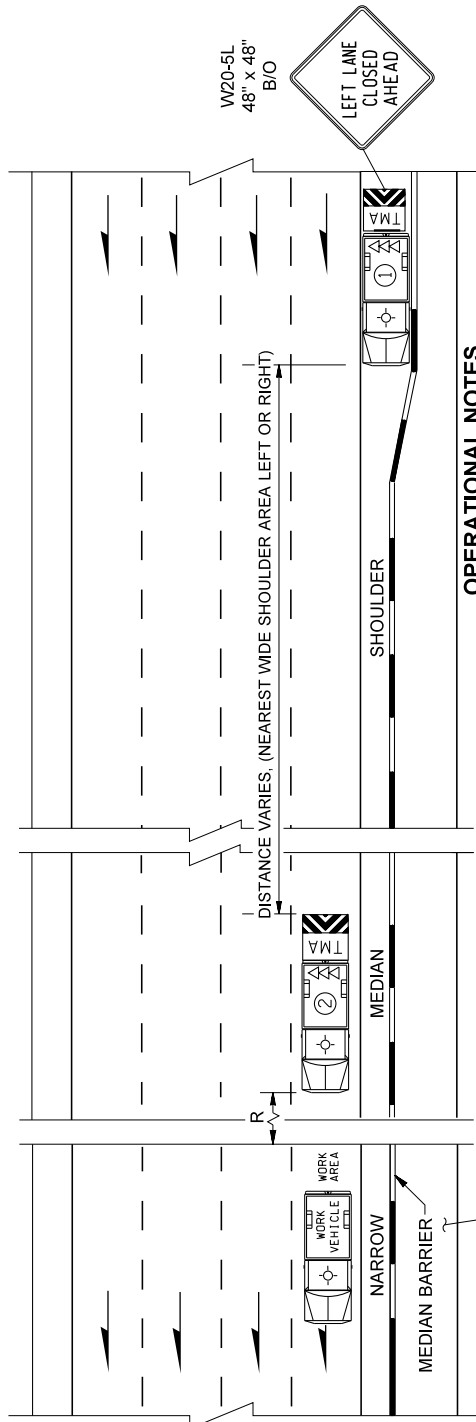
MOBILE TMA ROLL AHEAD DISTANCE = R			
HOST VEHICLE WEIGHT 9,900 TO 22,000 lbs.		HOST VEHICLE WEIGHT > 22,000 lbs.	
< 45 MPH	45-55 MPH	> 55 MPH	> 55 MPH
100'	172'	222'	100'
PROTECTIVE VEHICLE (WORK VEHICLE) = R		150'	172'
NO SPECIFIED DISTANCE REQUIRED			

(SAMPLE MESSAGE)

PCMS	
1	2
LEFT LANE CLOSED	MERGE RIGHT
2.0 SEC	2.0 SEC

Field locate in advance of lane closure.

TYPICAL FREEWAY APPLICATION
(ACTUAL NUMBER OF LANES MAY VARY)



NO WORKERS OR EQUIPMENT ALLOWED ON OPPOSITE DIRECTION SHOULDER WITHOUT IMPLEMENTING APPROPRIATE TRAFFIC CONTROL MEASURES.

OPERATIONAL NOTES

- Shadow vehicle #1, mount lane closure sign on back of vehicle or use truck mounted VMS. Do not obscure arrow board. maintain 1000' to 1500' of sight distance to approaching traffic. (TMA recommended).
- Protective vehicle #2, position vehicle to provide protection of crew. Maintain roll ahead distance (TMA required).
- A 2' minimum lateral clearance recommended between vehicles and adjacent lane. Use a Rolling slow down operation or stationary lane closure if lane encroachment is necessary.
- Contact Region Traffic Management Center prior to work begins and after ending.
- 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.
- PCMS recommended.

LEGEND

- ARROW BOARD (TYPE "B" MIN.)
- TRUCK MOUNTED ATTENUATOR
- VEHICLE WITH WARNING BEACON (REQUIRED)

TYPICAL MOBILE FREEWAY OPERATION
LEFT LANE CLOSURE
TCP 31

TCP 32 Typical Mobile Freeway Operation Middle Lane Work Area

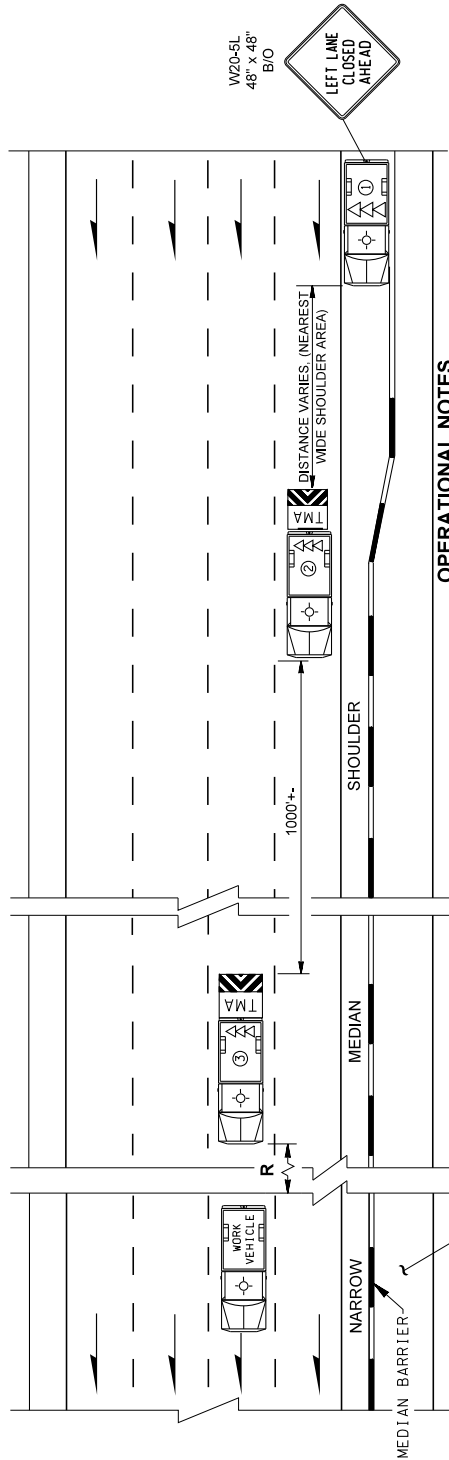
MOBILE TMA ROLL AHEAD DISTANCE = R			
HOST VEHICLE WEIGHT		HOST VEHICLE WEIGHT	
9,900 TO 22,000 lbs.		> 22,000 lbs.	
< 45 MPH	45-55 MPH	> 55 MPH	45-55 MPH
100'	172'	222'	100'
150'		172'	
PROTECTIVE VEHICLE (WORK VEHICLE) = R			
NO SPECIFIED DISTANCE REQUIRED			

TYPICAL FREEWAY APPLICATION
(ACTUAL NUMBER OF LANES MAY VARY)

(SAMPLE MESSAGES)

PCMS	
1	2
LEFT 2 LANES MOVING CLOSED	SLOW MOVING VEHICLES
2.0 SEC	2.0 SEC

MOUNT IN VEHICLE #1 & 2



OPERATIONAL NOTES

1. Advance warning vehicle #1, or use truck mounted VMS, maintain 1000' to 1500' sight distance to approaching vehicles. (TMA recommended)
2. Shadow vehicle #2, mount lane closure sign on back of vehicle. do not obscure arrow board. Maintain 1000' to 1500' 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 encroachment 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. PCMS recommended.

TYPICAL MOBILE FREEWAY OPERATION
MIDDLE LANE WORK AREA
TCP 32

NO WORKERS OR EQUIPMENT ALLOWED ON OPPOSITE DIRECTION SHOULDER WITHOUT IMPLEMENTING APPROPRIATE TRAFFIC CONTROL MEASURES

LEGEND

- ▷▷ ARROW BOARD TYPE "B" MIN.
- TMA TRUCK MOUNTED ATTENUATOR
- WORK VEHICLE VEHICLE WITH WARNING BEACON - (REQUIRED)

TCP 33 Typical Mobile Operation Two Lane Roadway Lane Closure

(SAMPLE MESSAGES)

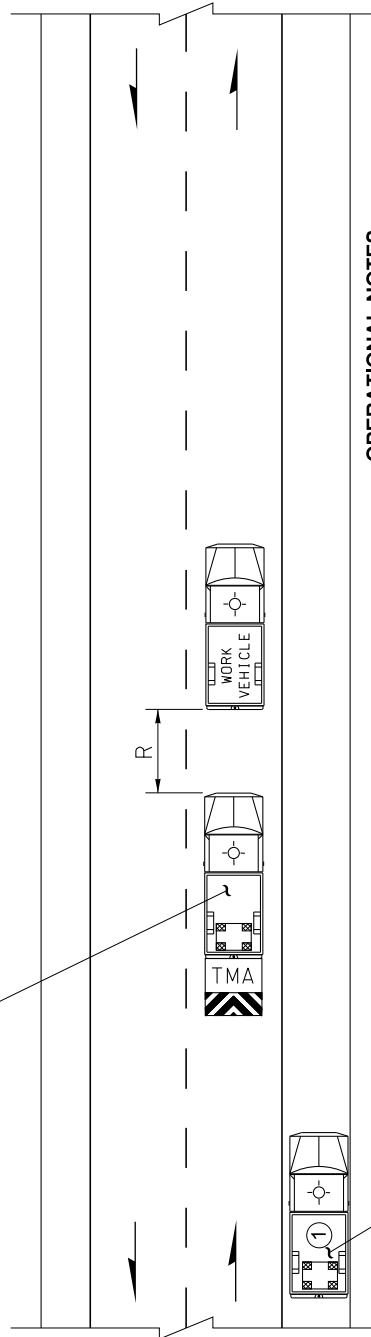
PCMS	
1	2
SLOW YIELD TO MOVING ONCOMING VEHICLES TRAFFIC	
2.0 SEC 2.0 SEC	

TRUCK MOUNTED PCMS (PROTECTIVE VEHICLE)

MOBILE TMA ROLL AHEAD DISTANCE = R		
HOST VEHICLE WEIGHT	HOST VEHICLE WEIGHT	
9,900 TO 22,000 lbs.	> 45 MPH	> 22,000 lbs.
< 45 MPH	45-55 MPH	> 55 MPH
100'	172'	222'
PROTECTIVE VEHICLE (WORK VEHICLE) = R		
NO SPECIFIED DISTANCE REQUIRED		

MOUNT ON PROTECTIVE VEHICLE

R4-1
36" x 48"
BW
(OPTIONAL)



OPERATIONAL NOTES

1. Advance warning vehicle #1, or use truck mounted VMS, maintain 1,000 ft to 1500 ft of sight distance to approaching vehicles. (TMA recommended).
2. Protective vehicle shall maintain 500 to 1000 ft of sight distance to approaching traffic.
3. Contact Regional Traffic office staff for assistance with specific in lane operations such as striping, fog seal, etc. that require additional plans and details.
4. "Do Not Pass" sign can be replaced with "Pass With Care" sign when appropriate.
5. Advance warning vehicle recommended 500 to 1000 ft in advance.

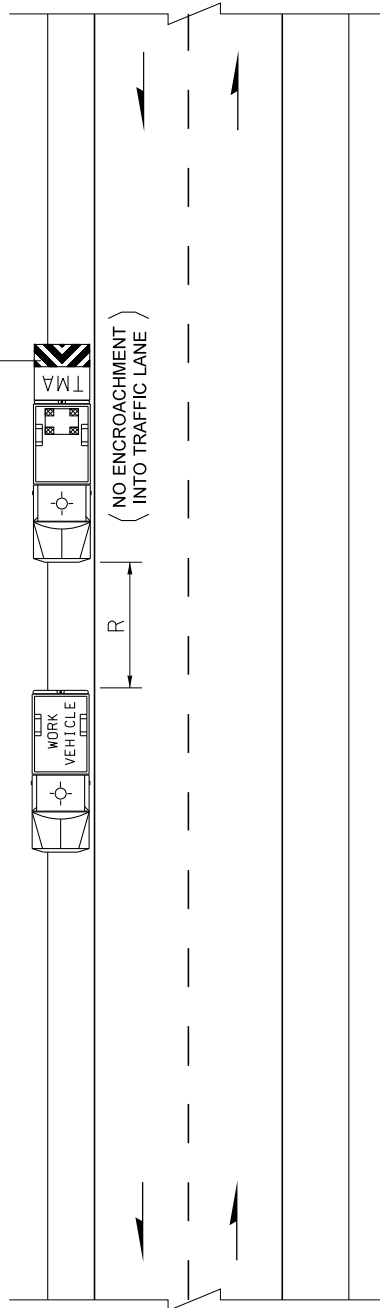
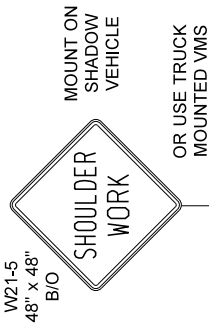
LEGEND

- ARROW BOARD TYPE "B" (CAUTION MODE)
- PROTECTIVE VEHICLE
- TRUCK MOUNTED ATTENUATOR (RECOMMENDED)
- WARNING BEACON - REQUIRED
- ADVANCE WARNING VEHICLE

TYPICAL MOBILE OPERATION
TWO LANE ROADWAY
LANE CLOSURE
TCP 33

TCP 34 Typical Mobile Operation Two Lane Roadway Shoulder Closure





MOBILE TMA ROLL AHEAD DISTANCE = R			
HOST VEHICLE WEIGHT		HOST VEHICLE WEIGHT	
9,300 TO 22,000 lbs.		> 22,000 lbs.	
< 45 MPH	> 55 MPH	< 45 MPH	> 55 MPH
100'	222'	100'	172'
PROTECTIVE VEHICLE (WORK VEHICLE) = R			
NO SPECIFIED DISTANCE REQUIRED			



OPERATIONAL NOTES

1. Protective vehicle shall maintain 500'-1000' 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.

LEGEND

-  ARROW BOARD TYPE "B" (CAUTION MODE)
-  TRUCK MOUNTED ATTENUATOR (RECOMMENDED)
-  WARNING BEACON - REQUIRED
-  PROTECTIVE VEHICLE

TYPICAL MOBILE OPERATION
TWO LANE ROADWAY
SHOULDER CLOSURE
TCP 34

Chapter 5 Special Details

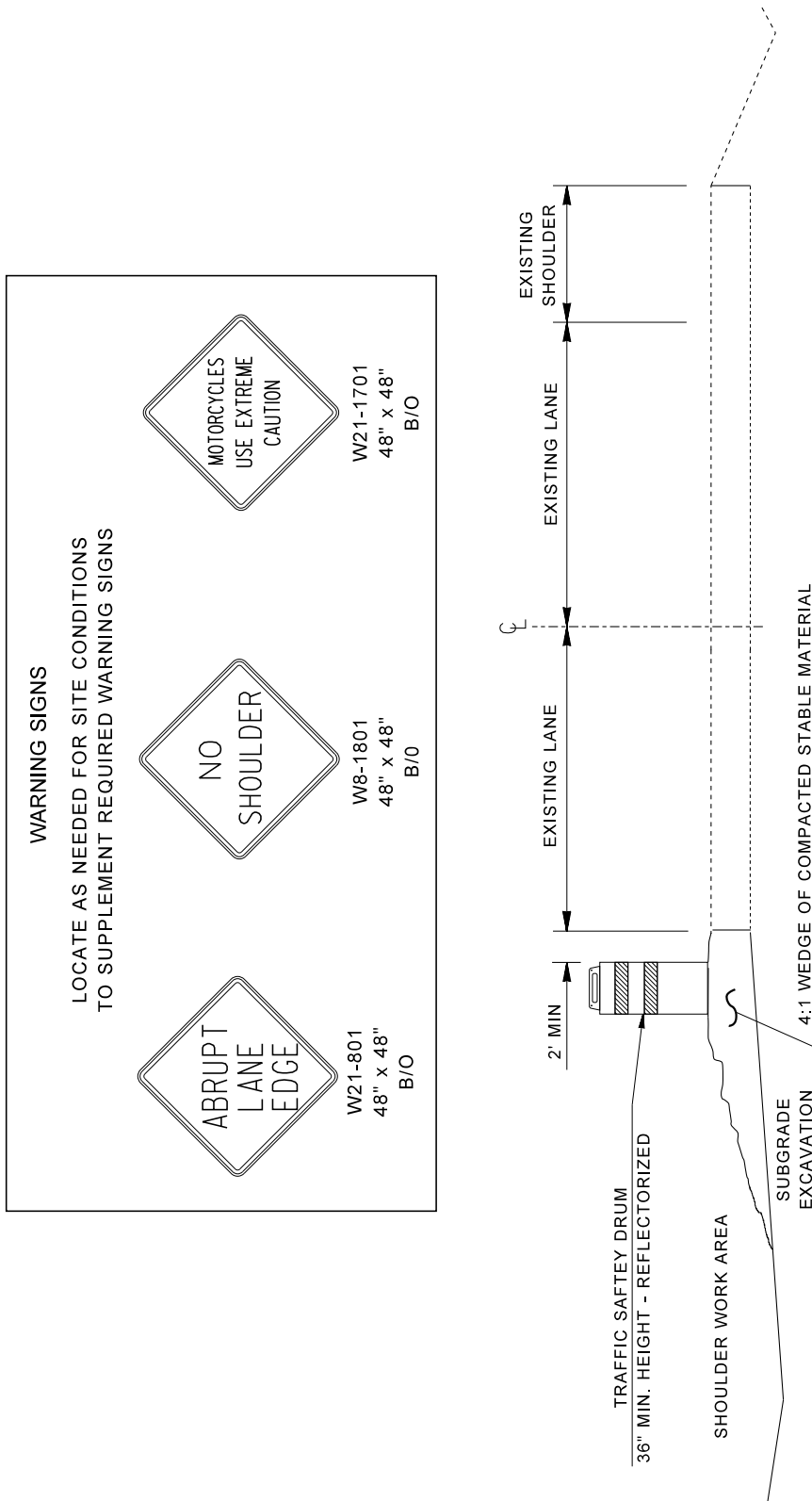
The following detail plans show examples which are difficult to show on other traffic control plans or where additional guidance is necessary.

- TCD 1 *Shoulder Work Area 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 Plan*

(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.)

TCD 1 Shoulder Work Area Protection



OPERATIONAL NOTES

1. Shoulder excavation shall be limited to one side of roadway at a time.
2. 28" cone or 42" tall channelization device may be used in lieu of a drum.
3. Refer to TCP 6 for shoulder closure requirements and information.
4. Drop-offs more than 0.20' are not allowed in the traveled way or auxiliary lane.

SHOULDER WORK AREA PROTECTION
TCD 1

TCD 2 Typical Motorcycle Signing Detail

W21-801	W8-1801	W8-1	W8-2001

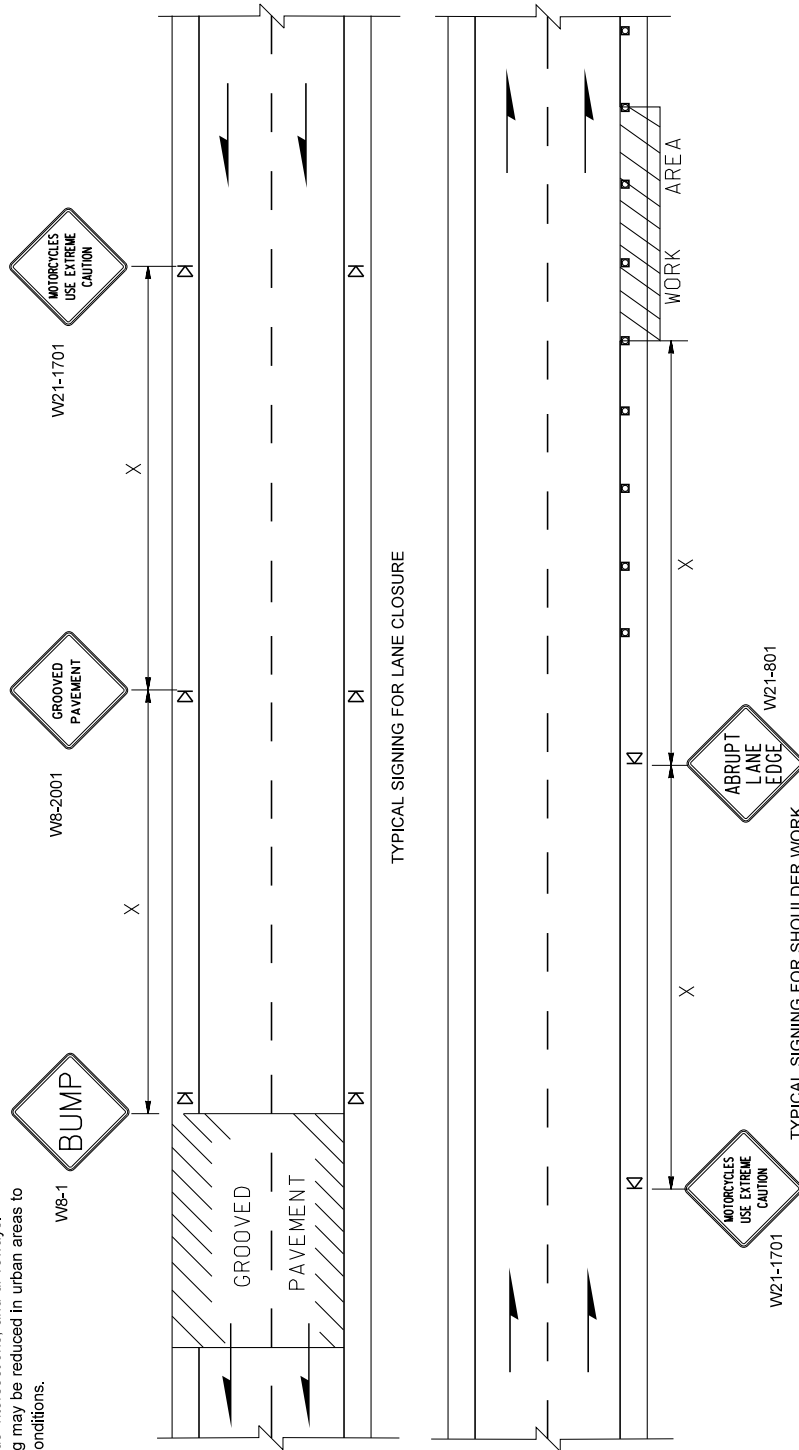
FIELD LOCATE AS NEEDED THROUGH WORK AREA TO SUPPLEMENT MOTORCYCLE WARNING SIGN (1 MILE INCREMENTS)

MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

Freeways & Expressways	55/70 MPH	1500 +-
Rural Highways	60/65 MPH	800 +-
Rural Roads	45/55 MPH	500 +-
Rural Roads & Urban Arterials	35/40 MPH	350 +-
Rural Roads, Urban Arterials, Residential & Business Districts	25/30 MPH	200 +- (2)
Urban Streets	25 MPH or LESS	100 +- (2)

ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

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



TYPICAL SIGNING FOR SHOULDER WORK

TYPICAL SIGNING FOR LANE CLOSURE

LEGEND

- K SIGN LOCATION
- CHANNELIZING DEVICES

NOTES

- 1. REFER TO OTHER TCD'S FOR TYPICAL LANE CLOSURE AND SHOULDER CLOSURE SIGNING DETAILS, DEVICE SPACING REQUIREMENTS AND TAPER LENGTHS.
- 2. USE OF APPROPRIATE WARNING SIGNS FOR ROAD CONDITION REQUIRED ALONG WITH THE MOTORCYCLE WARNING SIGN AS PER WAC 468-95-305.

TYPICAL MOTORCYCLE SIGNING DETAIL
TCD 2

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.

TCD 3 Typical Speed Zone Detail for Chip Seal Project

CHIP SEAL PROJECT NEXT X MILES AUG XX TO AUG XX		PCMS 1 CHIP SEAL PROJECT TO AUG XX 2 BEGINS AUG XX	
OR			
CHIP SEAL PROJECT NEXT X MILES AUG XX TO AUG XX		PCMS 1 CHIP SEAL PROJECT TO AUG XX 2 BEGINS AUG XX	

SP-1
48"X60"
B/O
TO BE FIELD LOCATED

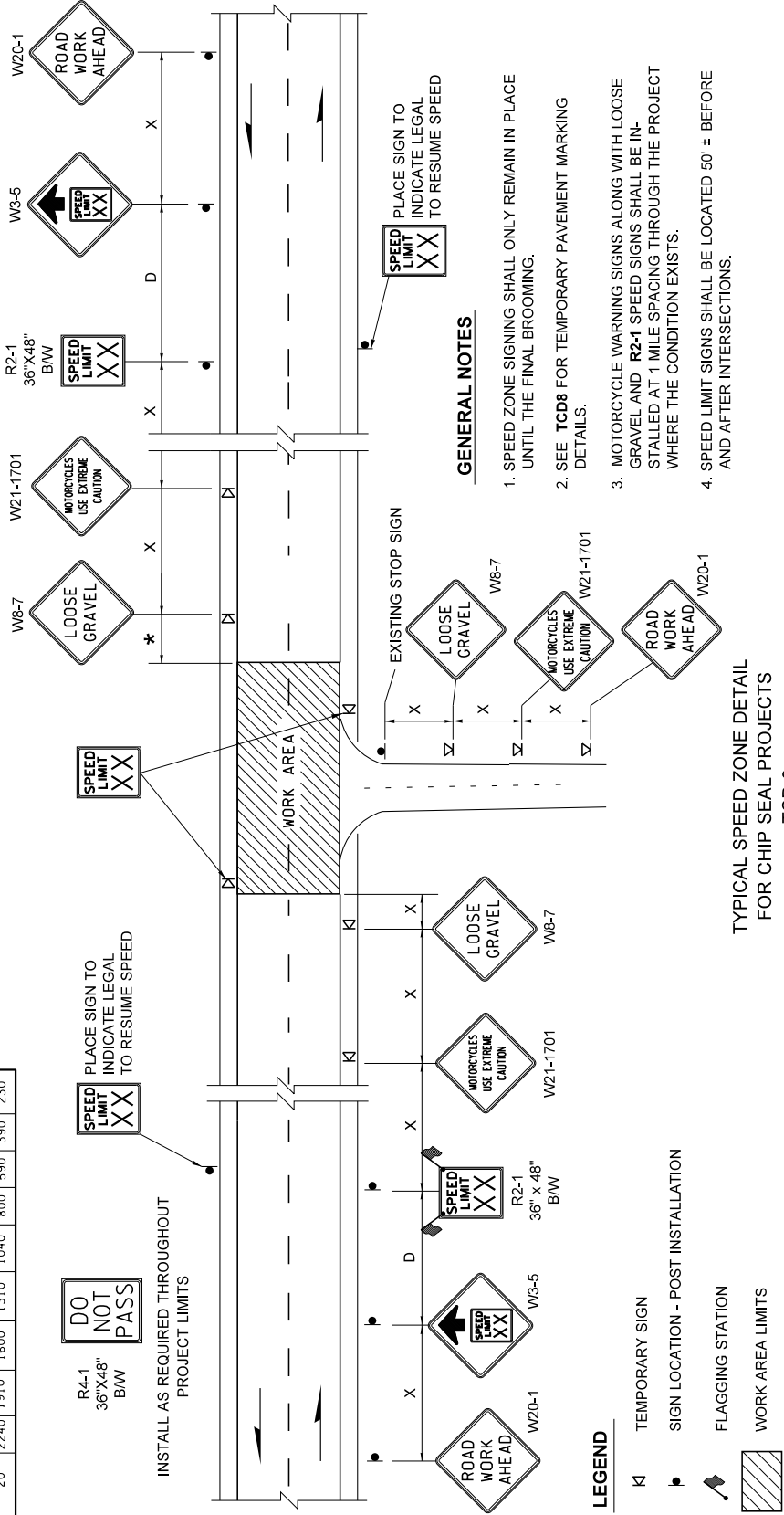
SIGN SPACING = X (feet) (1)

Rural Highways	60/65 MPH	800'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Arterials Residential & Business Districts	25/30 MPH	200'+- (2)
Urban Streets	25 MPH or LESS	100'+- (2)

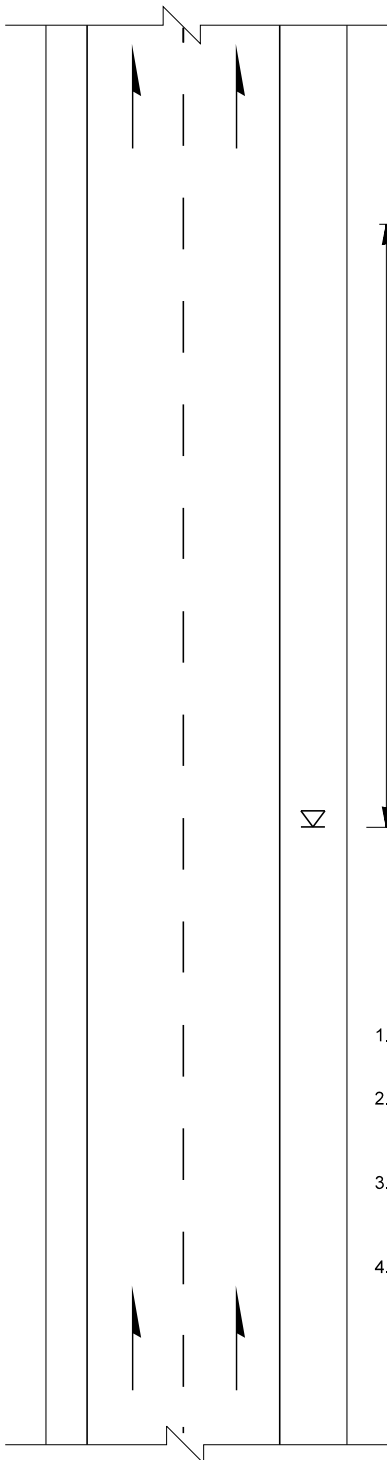
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.

(1) All spacing may be adjusted to accommodate intersections and driveways.
(2) This spacing may be reduced in urban areas to fit roadway conditions.

REDUCED SPEED LIMIT (mph)	70	65	60	55	50	45	40	35	30
65	430	--	--	--	--	--	--	--	--
60	720	390	--	--	--	--	--	--	--
55	1000	660	350	--	--	--	--	--	--
50	1250	910	600	310	--	--	--	--	--
45	1470	1140	820	540	270	--	--	--	--
40	1670	1340	1030	740	470	230	--	--	--
35	1850	1520	1200	920	650	410	200	--	--
30	2000	1670	1310	1070	810	570	350	160	--
25	2140	1800	1390	1200	940	700	480	290	120
20	2240	1910	1600	1310	1040	800	590	390	230



TCD 4 Typical Work Beyond the Shoulder



SIGN SPACING = X (feet) (1)		
Freeways & Expressways	55/70 MPH	1500'+-
Rural Highways	60/65 MPH	800'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Arterials Residential & Business Districts	25/30 MPH	200'+- (2)
Urban Streets	25 MPH or LESS	100'+- (2)
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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

(2) This spacing may be reduced in urban areas to fit roadway conditions.

LEGEND

▽ SIGN LOCATION



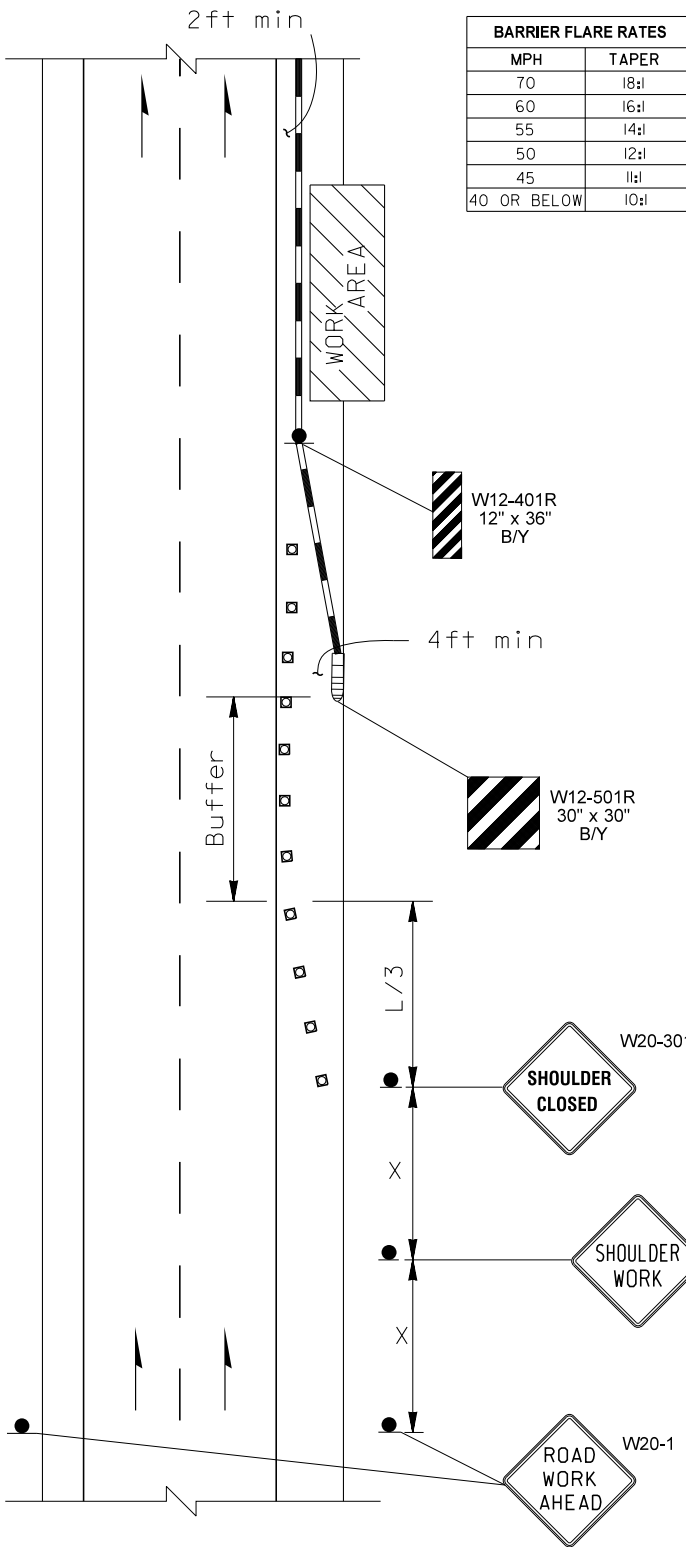
W20-1
48" x 48"
B/O

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 SPACE IS 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.

TYPICAL WORK BEYOND THE SHOULDER
TCD 4

TCD 5 Typical Long-Term Shoulder Closure on High Speed Roadway



BARRIER FLARE RATES	
MPH	TAPER
70	18:1
60	16:1
55	14:1
50	12:1
45	11:1
40 OR BELOW	10:1

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	155	200	250	305	360	425	495	570	645	730
TMA ROLL AHEAD DISTANCE = R										
HOST VEHICLE WEIGHT 9,900 TO 22,000 lbs.					HOST VEHICLE WEIGHT > 22,000 lbs.					
< 45 MPH	45-55 MPH	> 55 MPH	< 45 MPH	45-55 MPH	> 55 MPH	< 45 MPH	45-55 MPH	> 55 MPH		
100'	123'	172'	74'	100'	150'					
PROTECTIVE VEHICLE (WORK VEHICLE) = R										
NO SPECIFIED DISTANCE REQUIRED										

SIGN SPACING = X (feet) (1)		
Freeways & Expressways	55/70 MPH	1500'+-
Rural Highways	60/65 MPH	800'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Arterials Residential & Business Districts	25/30 MPH	200'+- (2)
Urban Streets	25 MPH or LESS	100'+- (2)
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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

STATIONARY TMA ROLL AHEAD DISTANCE = R					
HOST VEHICLE WEIGHT 9,900 TO 22,000 lbs.			HOST VEHICLE WEIGHT > 22,000 lbs.		
< 45 MPH	45-55 MPH	> 55 MPH	< 45 MPH	45-55 MPH	> 55 MPH
100'	123'	172'	74'	100'	150'
PROTECTIVE VEHICLE (WORK VEHICLE) = R					
NO SPECIFIED DISTANCE REQUIRED					

MINIMUM SHOULDER TAPER LENGTH = L/3 (feet)										
SHOULDER WIDTH (feet)	Posted Speed (mph)									
	8'	40	40	60	90	120	130	150	160	170
10'	40	60	90	90	150	170	190	200	220	240
USE A MINIMUM 3 DEVICES TAPER FOR SHOULDER LESS THEN 8'.										

CHANNELIZING DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60

- LEGEND**
- POST MOUNTED SIGN
 - ☒ ☒ ☒ CHANNELIZING DEVICES
 - ▭▭▭▭▭ TEMPORARY IMPACT ATTENUATOR
 - ▬▬▬▬▬ TEMPORARY BARRIER

- NOTES:**
1. BARRIER END MUST BE TREATED WITH APPROVED TEMPORARY IMPACT ATTENUATOR APPROPRIATE FOR THE SPECIFIC LOCATION.

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 7 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 are at least one traffic control vehicle (with flashing amber lights) per two lanes, **and** one vehicle to cover every point of access onto the “rolling slowdown” segment of roadway. (Only during emergencies should less than one traffic control vehicle per lane be considered.) Truck mounted PCMS boards stating, “Slow or Stopped Vehicles” are very helpful. **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

Known:

T = Time needed with no traffic (in minutes)

V_s = Speed of slowdown vehicles (in mph) 20 mph minimum recommended

V_c = Speed of chaser vehicle in front of slowdown (in mph) generally it should be the posted speed

Calculations:

G = Gap needed (in miles)

$$G = T (V_s/60)$$

C = Clearance time needed to create the gap (in minutes)

$$C = G / (V_c/60 - V_s/60)$$

D = Distance ahead of the work area to start the slowdown (in miles)

$$D = C (V_c/60)$$

Example:

Say you need a 5 minute gap on a 60 mph freeway to cross a large piece of equipment into the median work area, so you propose a 20 mph rolling slowdown during the off-peak or lowest traffic volume hours for the freeway.

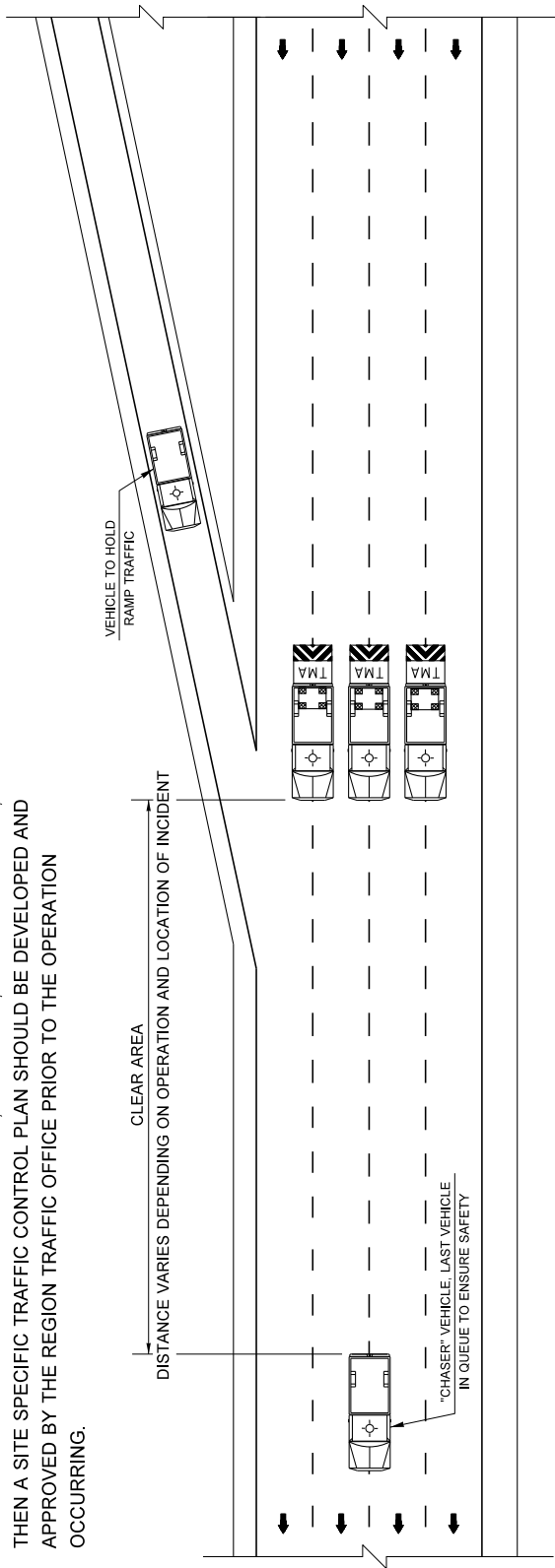
G = $5 (20/60) = 1.67$ miles

C = $1.67 / (60-20/60) = 2.5$ minutes

D = $2.5 (60/60) = 2.5$ miles

TCD 6 Typical Rre Channelization Plan

THIS PLAN DEPICTS THE MINIMUM REQUIREMENTS TO PERFORM AN EMERGENCY ROLLING SLOWDOWN. IF THE SLOWDOWN IS, OR CAN BE, A PLANNED EVENT, THEN A SITE SPECIFIC TRAFFIC CONTROL PLAN SHOULD BE DEVELOPED AND APPROVED BY THE REGION TRAFFIC OFFICE PRIOR TO THE OPERATION OCCURRING.



(SAMPLE MESSAGE)

TRUCK MOUNTED PCMS	PCMS
1	2
SLOW OR STOPPED VEHICLES	DO NOT PASS
2.0 SEC	2.0 SEC




PCMS	PCMS
1	2
CAUTION SLOWING TRAFFIC	OR STOPPED VEHICLES
2.0 SEC	2.0 SEC

FIELD LOCATE 1 MILE (++) IN ADVANCE OF LANE CLOSURE

OPERATIONAL NOTES

1. ALL WORK VEHICLES SHALL USE WARNING BEACONS.
2. THE NUMBER OF VEHICLES SHOWN IS A MINIMUM. IF POSSIBLE USE ONE VEHICLE PER LANE DURING CLOSURE.
3. NOTIFY WSP PRIOR TO OPERATION SO THEY ARE AWARE OF OPERATION.
4. ALL ON-RAMP TRAFFIC SHALL BE STOPPED DURING SLOWDOWN.
5. USE CALCULATION CHART TO DETERMINE CLEAR AREA.

LEGEND

-  TRUCK MOUNTED ATTENUATOR (RECOMMENDED)
-  WARNING BEACON - REQUIRED
-  ARROW BOARD CAUTION MODE (REQUIRED)

TYPICAL ROLLING SLOWDOWN
TCD 6

TCD 7 – Emergency Operations

The immediate response to an emergency situation 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.

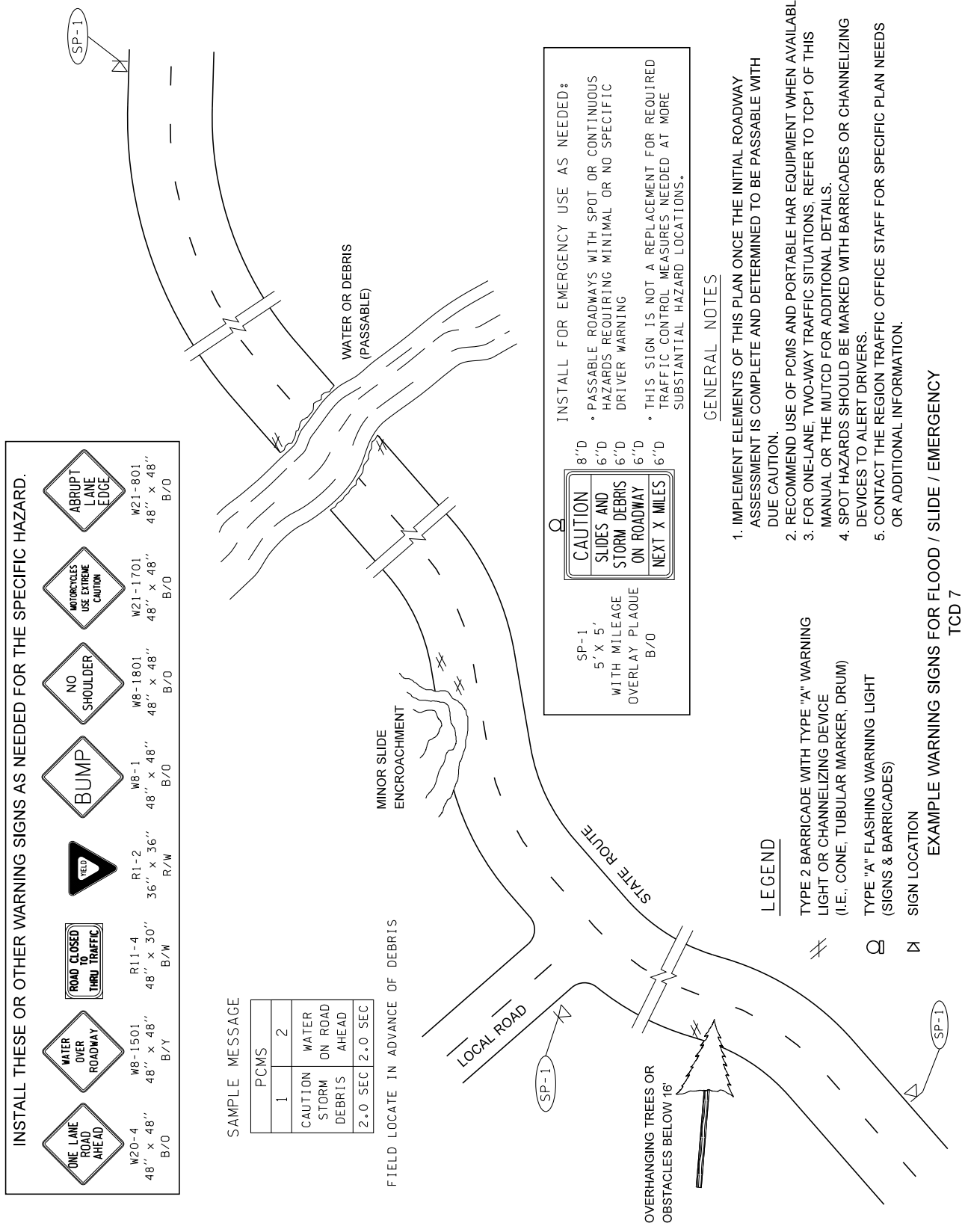
Implement the appropriate traffic control plan (lane closure, etc.) if the situation is expected to last longer than 60 minutes. This allows for a short duration operation, until traffic control assistance arrives.

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 8 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. Refer to Section 3.2 for additional guidance.

Response to an emergency situation is inherently more dangerous than planned situations. Do not expose yourself to a life-threatening situation. Wait for assistance and protect yourself at all times.

TCD 7 Example Warning Signs for Emergencies



INSTALL THESE OR OTHER WARNING SIGNS AS NEEDED FOR THE SPECIFIC HAZARD.

	W20-4	48" x 48"	B/O
	W8-1501	48" x 48"	B/Y
	R11-4	48" x 30"	B/W
	R1-2	36" x 36"	R/W
	W8-1	48" x 48"	B/O
	W8-1801	48" x 48"	B/O
	W21-1701	48" x 48"	B/O
	W21-801	48" x 48"	B/O

SAMPLE MESSAGE

PCMS	1	2
CAUTION	WATER	
STORM	ON ROAD	
DEBRIS	AHEAD	
2.0 SEC	2.0 SEC	

INSTALL FOR EMERGENCY USE AS NEEDED:

- PASSABLE ROADWAYS WITH SPOT OR CONTINUOUS HAZARDS REQUIRING MINIMAL OR NO SPECIFIC DRIVER WARNING
- THIS SIGN IS NOT A REPLACEMENT FOR REQUIRED TRAFFIC CONTROL MEASURES NEEDED AT MORE SUBSTANTIAL HAZARD LOCATIONS.

GENERAL NOTES

- IMPLEMENT ELEMENTS OF THIS PLAN ONCE THE INITIAL ROADWAY ASSESSMENT IS COMPLETE AND DETERMINED TO BE PASSABLE WITH DUE CAUTION.
- RECOMMEND USE OF PCMS AND PORTABLE HAR EQUIPMENT WHEN AVAILABLE
- FOR ONE-LANE, TWO-WAY TRAFFIC SITUATIONS, REFER TO TCP1 OF THIS MANUAL OR THE MUTCD FOR ADDITIONAL DETAILS.
- SPOT HAZARDS SHOULD BE MARKED WITH BARRICADES OR CHANNELIZING DEVICES TO ALERT DRIVERS.
- CONTACT THE REGION TRAFFIC OFFICE STAFF FOR SPECIFIC PLAN NEEDS OR ADDITIONAL INFORMATION.

LEGEND

TYPE 2 BARRICADE WITH TYPE "A" WARNING LIGHT OR CHANNELIZING DEVICE (I.E., CONE, TUBULAR MARKER, DRUM)

TYPE "A" FLASHING WARNING LIGHT (SIGNS & BARRICADES)

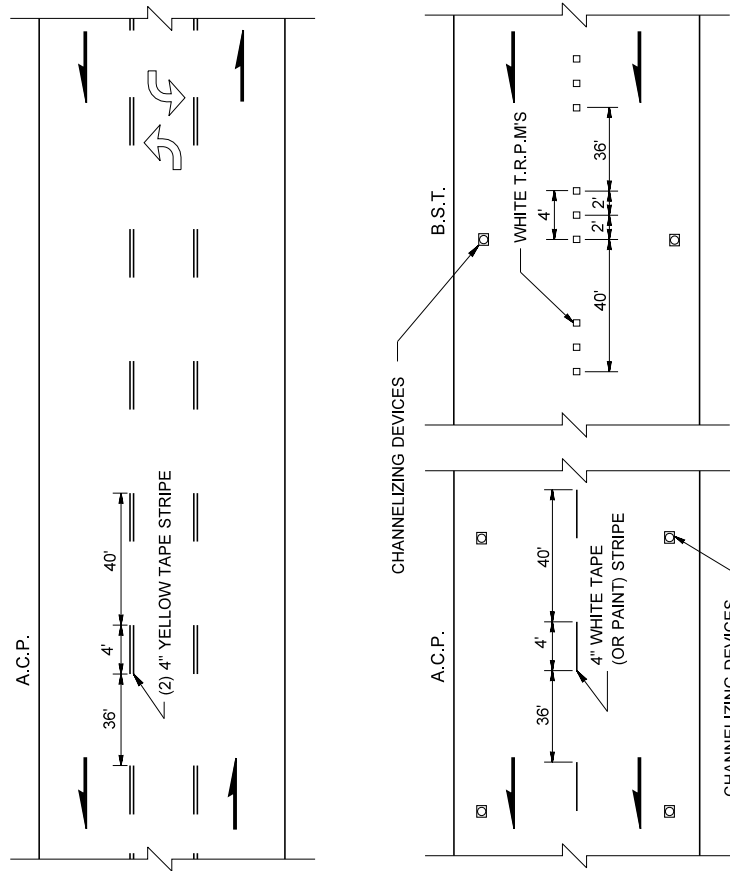
SIGN LOCATION

EXAMPLE WARNING SIGNS FOR FLOOD / SLIDE / EMERGENCY
TCD 7

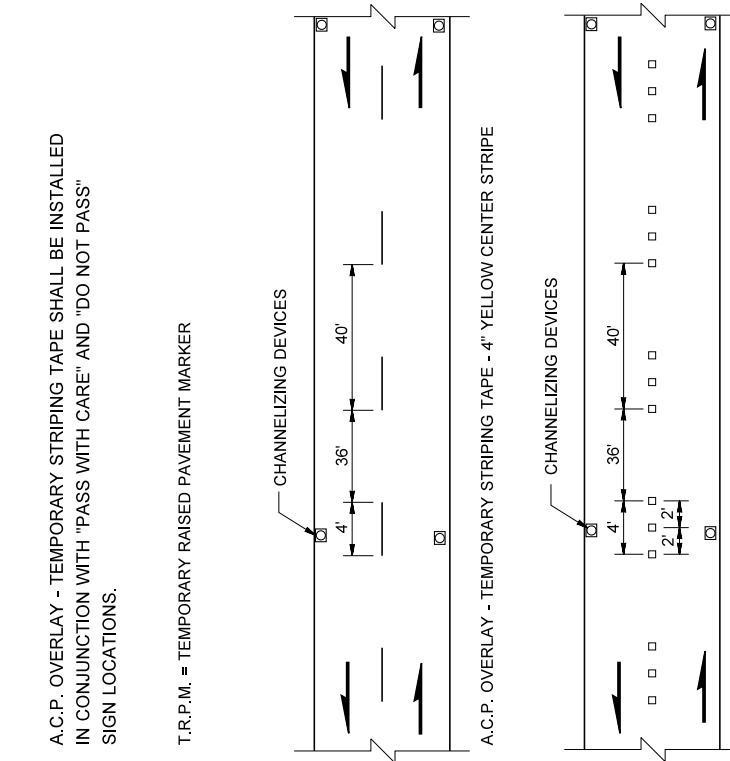
TCD 8 Temporary Pavement Marking Details

WORK OPERATIONS THAT REMOVE OR OBSCURE 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



2 LANE ROADWAYS



TEMPORARY EDGE STRIPES ARE NOT REQUIRED FOR THE ABOVE SITUATIONS BUT IF USED, T.R.P.M.'S MAY BE USED ON A PATTERN SPACING OF 5' O.C. TO SIMULATE A SOLID LINE. TEMPORARY ROADSIDE DELINEATION WITH CHANNELIZATION DEVICES SHOULD BE CONSIDERED, BUT ARE OPTIONAL. DO NOT USE A "SKIP" PATTERN OF TAPE STRIPE TO SIMULATE AN EDGE STRIPE.

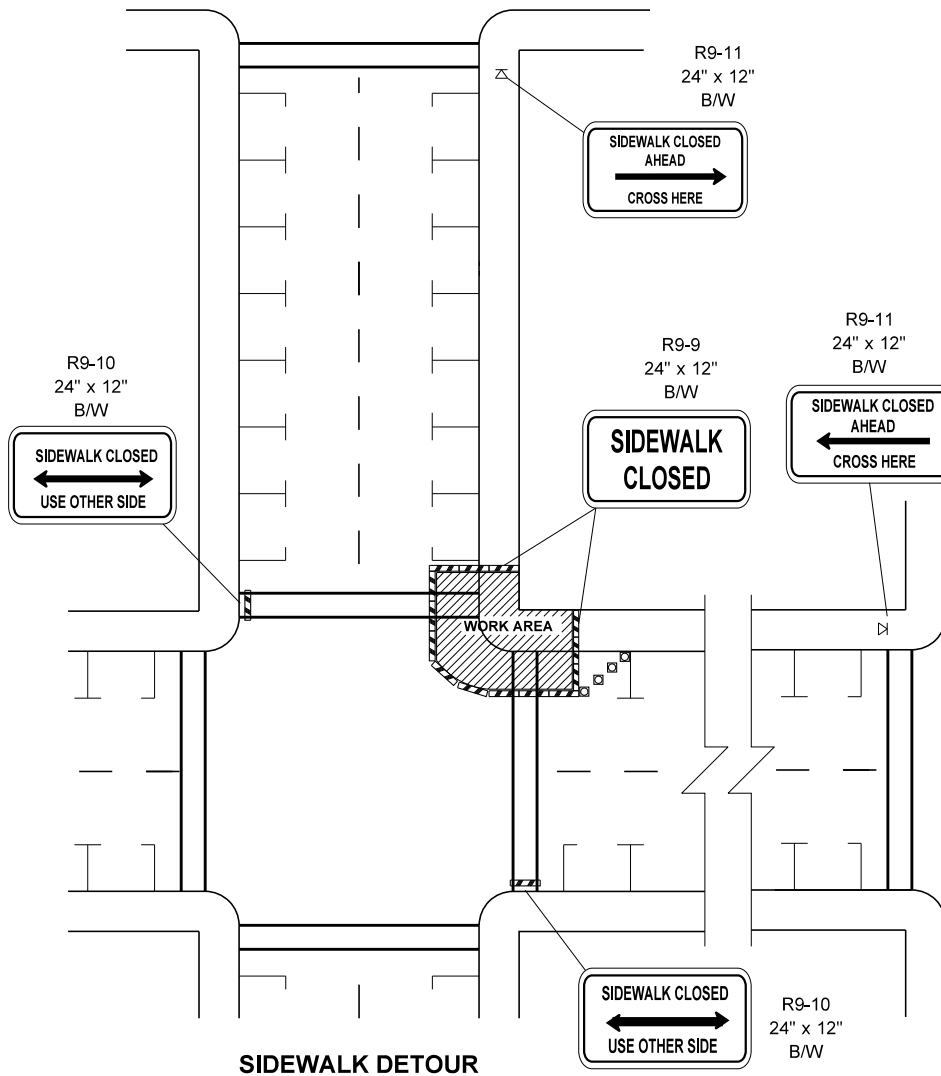
FOR LONG TERM PROJECTS, A TEMPORARY CHANNELIZATION/PAVEMENT MARKING PLAN SHOULD BE DEVELOPED.

CHANNELIZATION DEVICE SPACING - TANGENT 200' +-
 CURVES 100' +- O.C.
 TAPERS 1/2 L

TEMPORARY PAVEMENT MARKING DETAILS

TCD 8

TCD 9 Typical Intersection Pedestrian Traffic Control



GENERAL NOTES

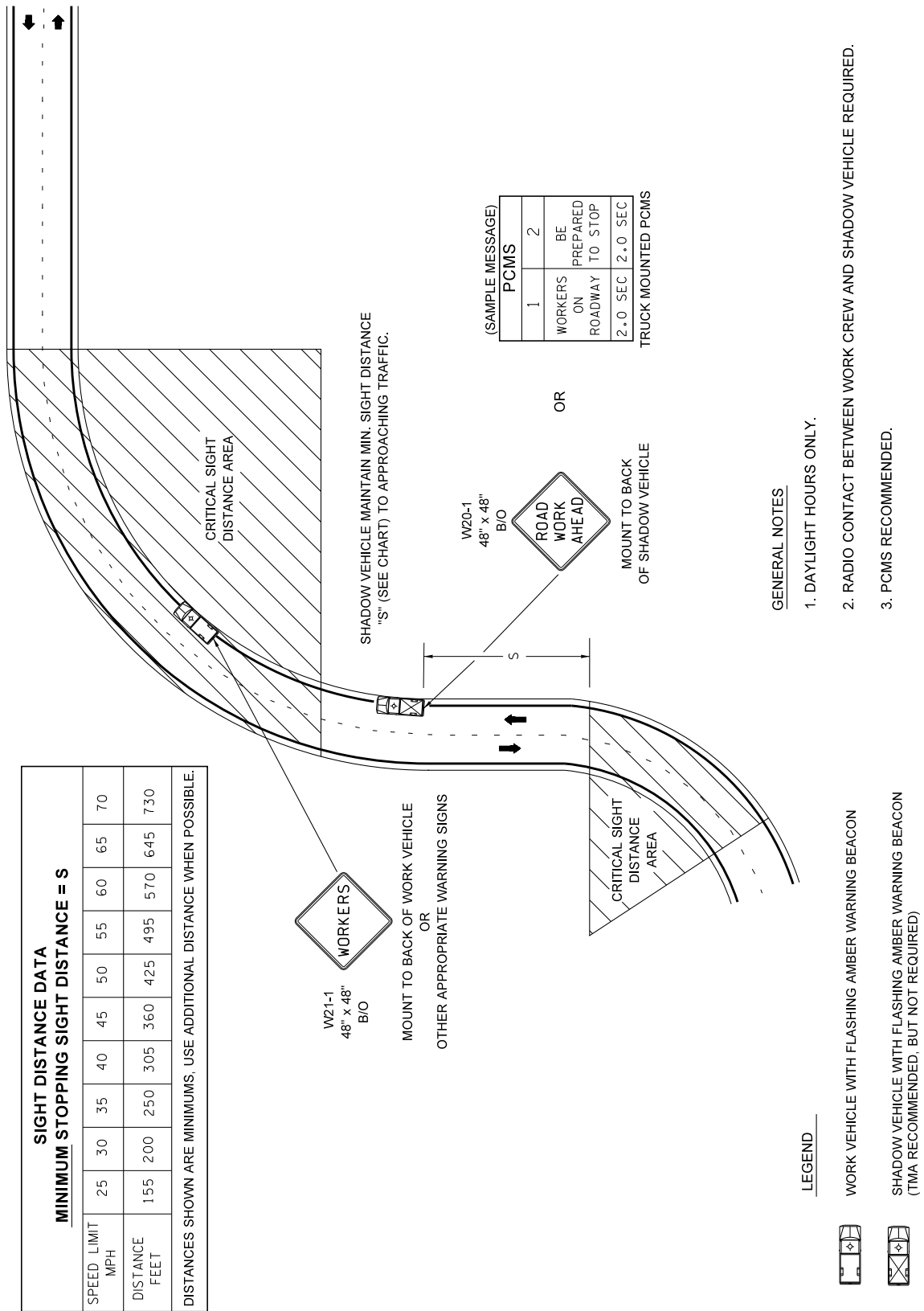
LEGEND

- ⊠ TEMPORARY SIGN LOCATION
- ▣ CHANNELIZING DEVICES
- ▨ TYPE 2 BARRICADE OR LONGITUDINAL CHANNELIZATION DEVICES

1. Controls shown are for pedestrian traffic only.
2. Coordinate with impacted transit agencies prior to implementing any closures.
3. Existing ADA facilities must be maintained. See MUTCD Section 6d and figures TA-28 & 29 for additional information.
4. Use of longitudinal channelization or pedestrian devices is preferred for closing the pedestrian facility. See MUTCD Section 6F.71 and 1.8 this manual.

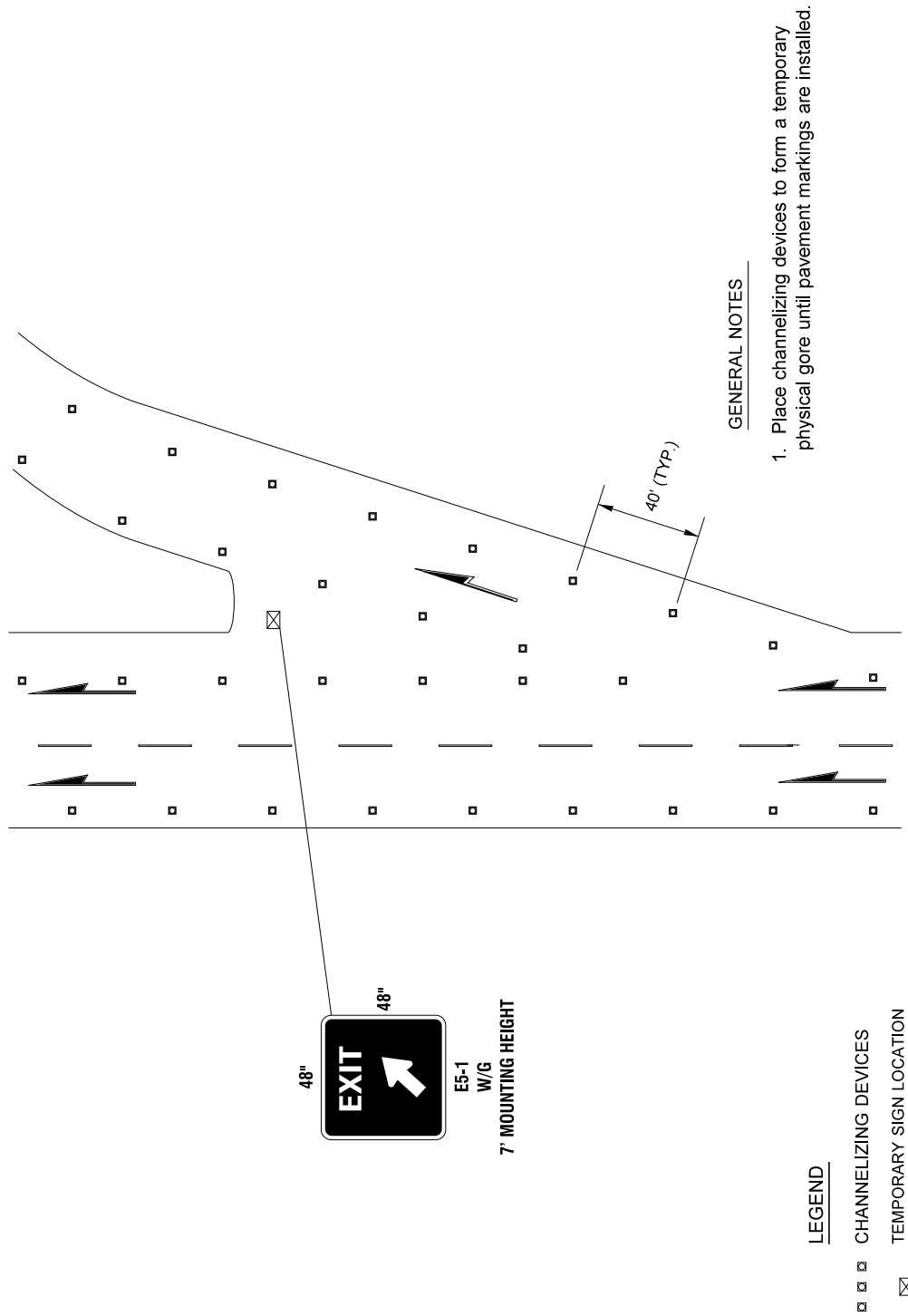
TYPICAL INTERSECTION PEDESTRIAN TRAFFIC CONTROL
TCD 9

TCD 10 Typical Mobile Shoulder Operation with Lane Encroachment



TYPICAL MOBILE SHOULDER OPERATION WITH LANE ENCROACHMENT
TCD 10

TCD 11 Typical Exit Gore Channelization Plan



TEMPORARY EXIT GORE
TCD 11

Appendices

- Appendix 1 Checklist for Establishing a Temporary Traffic Control Zone*
- Appendix 2 Taper/Channelizing Device Table
- Appendix 3 Reference Manuals

Appendix 1 Checklist for Establishing a Temporary Traffic Control Zone*

- | Completed | Item |
|--------------------------|--|
| <input type="checkbox"/> | Determine the duration of work (Stationary, Short-Duration, very short duration or Mobile) * |
| <input type="checkbox"/> | Select an appropriate TCP for the work based on location, duration, type of roadway, traffic volume and speed. (See volume considerations in Section 1.9.10). |
| <input type="checkbox"/> | Make any necessary modifications to the TCP to address site specific conditions like intersections, driveways or sight distance restrictions. Document these modifications.* |
| <input type="checkbox"/> | Make accommodations for pedestrians and ADA needs as appropriate. |
| <input type="checkbox"/> | Determine work hours avoiding peak traffic times (refer to a region work hour chart or contact the Region Traffic Office for assistance) * |
| <input type="checkbox"/> | Check the condition and availability of devices (refer to Quality Guidelines Booklet). |
| <input type="checkbox"/> | 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. |
| <input type="checkbox"/> | Allow for buffer space free of obstructions. |
| <input type="checkbox"/> | Conduct a drive through to check for problems. Make adjustments as appropriate. Document these adjustments. |
| <input type="checkbox"/> | Continuously maintain devices while in place. |
| <input type="checkbox"/> | Remove devices as soon as the work is completed, beginning with the last device placed. |

*Utilize the Region Traffic Office staff for assistance to address specific concerns and questions.

Appendix 2

Taper/Channelizing Device Table

Merging, Shifting, and Shoulder Taper Lengths and Number of Channelization Devices Used

(All minimums)

Lane Width	10 Feet						11 Feet						12 Feet						Shoulder Tapers (Assumes 10' Shoulders)		
	L		1/2 L		L		1/2 L		L		1/2 L		L		1/2 L		MPH	(ft) Length	Devices		
	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices					
20	70	6	35	3	75	6	40	3	80	6	40	3	80	6	40	3	20	25	3		
25	105	6	55	4	115	7	60	4	125	7	65	4	125	7	65	4	25	35	3		
30	150	8	75	5	165	9	85	5	180	10	90	5	180	10	90	5	30	50	3		
35	205	8	105	5	225	9	115	5	245	9	125	5	245	9	125	5	35	70	4		
40	270	10	135	6	295	11	150	6	320	12	160	6	320	12	160	6	40	90	4		
45	450	16	225	9	495	18	250	9	540	19	270	10	540	19	270	10	45	150	6		
50	500	14	250	8	550	15	275	8	600	16	300	9	600	16	300	9	50	170	6		
55	550	15	275	8	605	16	305	9	660	18	330	9	660	18	330	9	55	185	6		
60	600	16	300	9	660	18	330	9	720	19	360	10	720	19	360	10	60	200	6		
65	650	17	325	9	715	19	370	10	780	21	390	11	780	21	390	11	65	220	7		
70	700	19	350	10	770	20	385	11	840	22	420	12	840	22	420	12	70	235	7		

Device Spacing Chart

50/70 mph	40 ft	80 ft
35/45 mph	30 ft	60 ft
25/30 mph	20 ft	40 ft

* 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.

Appendix 3

Reference Manuals

WSDOT *Construction Manual* M 41-01
WSDOT *Design Manual* M 22-01
WSDOT *Maintenance Manual* M 51-01
WSDOT *Sign Fabrication Manual* M 55-05
WSDOT *Standard Plans* M 21-01
WSDOT *Standard Specifications* M 41-10
WSDOT *Traffic Manual* M 51-02
[Manual on Uniform Traffic Control Devices](#)
[WSDOT Work Zone Safety](#) webpage