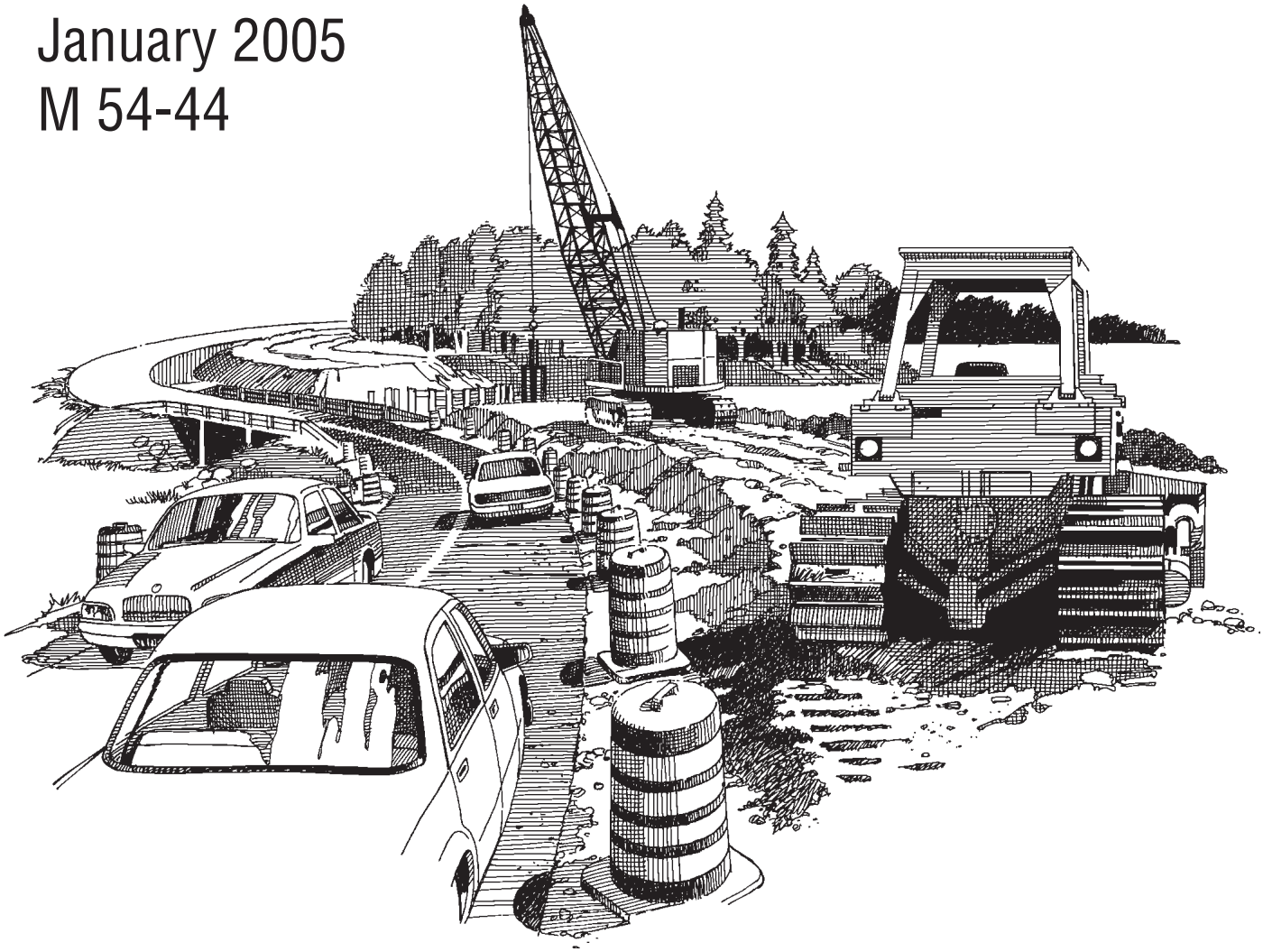
Work Zone Traffic Control Guidelines

January 2005
M 54-44



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Forward

While this booklet provides interpretive guidance, it does not change the intent of Part VI of the Manual on Uniform Traffic Control Devices (MUTCD). The traffic control devices and distances shown in this booklet reflect desired minimums for state routes.

Effective traffic control is essential, not only for the safety of the traveling public, but also for WSDOT employees and those whose jobs often require them to be in close proximity to high-speed traffic. The traffic control guidelines in this booklet 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 traffic control plans in this booklet 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 booklet. If you have any questions or needs not addressed here, please consult your Regional Traffic Office staff.

Be assured that along with the Work Zone Safety Task Force, we are committed to securing increased funding for better and safer work zones through the legislative process to meet your workforce and equipment needs.

Don Nelson	Gummada Murthy
/s/ Don Nelson	/s/ Gummada Murthy
Environmental and Engineering Director	Maintenance and Operations Director

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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. 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 traversing temporary traffic control zones.

The traffic control plans contained in this booklet are furnished as a guide to be used along with good judgment. Minor modifications may be made, as necessary, to accommodate site conditions; however, a plan's original intent must be maintained. An alternate plan should be considered if substantial revisions are needed. Consult the Region Traffic Office Staff for additional guidance.

Traffic control plans and procedures consistent with these guidelines should be developed to address the specific needs of work operations that are not included in this guide.

This set of traffic control plans is not intended to satisfy all conditions for all work zones. The Manual on Uniform Traffic Control Devices (MUTCD) is adopted by WSDOT as the legal standard. Principles set forth in Part VI of the MUTCD titled "Temporary Traffic Control" are represented in this booklet to provide traffic control guidance for common work operations.

This guidebook does not specifically address individual types of work operations. Standards do not allow exceptions based on work type. Many types of work operations such as surveying, maintenance, utility, developer, etc. can be applied to the guidance and plans contained within.

The typical applications (TA's) shown in MUTCD Part 6 may/should be considered and used as needed to develop or implement TCP's within the intent of this guidance.

Instructions

Considerations

1. Provide substantial protection and minimize worker exposure to traffic by applying barriers and devices in practical ways. Long-term projects may warrant the use of concrete barrier while short-term projects can be better served by a truck-mounted attenuator (TMA). Always consider the use of positive protection.

2. Prior to the beginning of work operations, evaluate all aspects of the work area, including sight distance, traffic speed, volume, road approaches and the type of work activity, before deciding on a traffic control plan.

3. After the traffic control plan is implemented, the supervisor (i.e. the person(s) supervising the actual work task(s) for which the TCP was implemented – e.g. Maintenance Lead Tech, Construction Project TCS(s) – both WSDOT and contractor, survey party chief) should drive through the work area, at the anticipated speed of the motorists, to determine the effectiveness

of the plan. Additional reviews throughout the day are recommended to insure that traffic control devices remain in place.

4. Traffic control devices shall be moved ahead whenever work advances to more than 2 miles from the advance warning signs.

5. Contact region traffic management center (TMC) prior to starting work when appropriate, based on region polices. Also consider coordination with region public information officer (PIO) for public notification when adverse traffic impacts are anticipated.

6. Plan ahead for manpower, equipment, and materials, (such as signs, channelizing devices, pavement marking materials, etc.) needed for traffic control.

7. The distances shown on the traffic control plans are desirable minimum requirements. Device spacing, buffer space, and sign spacing might require adjustments to provide for site conditions. Reductions in taper length distances are not allowed. Reductions in roll-ahead distances are allowed, see page 4, item number 5 for additional information.

8. The Washington State Patrol is available to assist WSDOT by enforcing excessive speed and impaired driver laws in critical work zone traffic control situations. These may include nighttime lane closures on high volume/high speed freeways or road closures. Contact the Region Traffic Office Staff for specific information regarding procedures to utilize the WSP.

9. Traffic control devices are used to visually guide drivers through work zones. Signing, channelizing devices, arrow panels and warning beacons all display a message to the driver. Work zone credibility is established through the proper use of these devices to send correct messages to drivers. Poor work zone credibility has a direct, negative, impact on work zone safety by causing driver confusion, frustration and disrespect which results in a high potential for accidents.

10. During paving operations, temporary pavement markings shall be maintained throughout the project. Temporary pavement markings shall be installed on the roadway that was paved that day. Temporary pavement markings shall be in accordance with page 70, TCD5 (Temporary Pavement Marking Details) and Std. Spec. 8-23.

11. Traffic delays due to work zone restrictions must be addressed. Excessive delays contribute to work zone incidents of road rage or crashes. Traffic capacity issues must be addressed with the region traffic office prior to starting work. Traffic should not be allowed to back up past the advance warning signs. Sign locations may need to be adjusted to fit actual site conditions or additional signs added to the sequence.

Personal Attributes

1. **Awareness:**
   Routinely working near traffic for extended periods of time can cause workers to become 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.

2. **Alertness:**
   There is no place on a *"traffic exposed"* work crew for a daydreamer or distracter. Each individual, for their own protection and that of the crew, must stay constantly alert and watchful.

3. **Attitude:**
   A positive, safety-conscious, attitude on the part of each crewmember will contribute greatly to the overall safety of crew operations.

4. **Responsibility:**
   Each person is responsible for ensuring their own safety and to see all standards are followed. This includes ensuring temporary signs, warning devices, and flag persons are placed appropriately to protect both the motorists and workers. **Motorist and worker safety are of primary importance.**

Equipment

1. **Traffic Control Device Crash Test Requirements:**
   After October 1, 2000, all new purchases of Category II traffic control devices (portable sign stands with signs, type 1, 2, & 3 barricades, vertical panels, intrusion alarms, and other work zone devices under 100 lbs.) shall be compliant with the federal NCHRP 350 crash test requirements. WSDOT will phase out existing devices as they complete their normal service life. All Category II devices will be "350" compliant by December 31, 2007.

2. **Condition and Care of Equipment:**
   All personal equipment and traffic control devices shall be kept clean to provide protection for the crew through better visibility to the motorist. The condition of signs and traffic control devices shall be new or "acceptable" as defined in the book "*Quality Guidelines for Work Zone Traffic Control Devices*", and will be accepted based on a visual inspection. A sign or traffic control device determined to be "not acceptable" shall be removed from the project. Copies of the Quality Guidelines book may be obtained from ATSSA.

3. **Signs:**
   Signs that are no longer retro-reflective (visible and legible at night) or are in poor condition are to be replaced. Standard 48" x 48" temporary warning signs are diamond shape with black letters or symbols on an orange background. See appendix 2-2, page 83-86 for information on work zone signs and example sheet of sheeting samples.

   Some work areas might require the use of special or regulatory signs, contact region traffic office for assistance with special signs. Use of double-faced (back-to-back) signs is not allowed. Sign supports must be in good condition and be capable of withstanding normal wind stresses along the highway.

4. **Vehicles:**

- **Work Zone Vehicle** - All construction vehicles, except hauling vehicles, used 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 when the workers are at an unexpected location.

- **Protective Vehicle** - Usually a stationary vehicle (in stationary work zones) strategically placed in advance of the work area, between the buffer space and the roll-ahead space, to protect workers from oncoming traffic. The use of a Truck Mounted Attenuator (TMA) on this vehicle is recommended. Allow for roll-ahead distance resulting from an impact. Refer to the data block on the TCPs for specific information. The Protective vehicle can be a work vehicle if no other vehicles are available.

- **Shadow Vehicle** - Very similar to the protective vehicle but usually a moving vehicle (mobile work zones). All of the above guidelines for the protective vehicle applies to the shadow vehicle except for the roll-ahead distances only apply to a stationary operation. A sequential arrow panel or truck mounted Portable Changeable Message Sign (PCMS) may also be used on the shadow vehicle.

5. **Truck Mounted Attenuators (TMA):**
A truck mounted attenuator (TMA) is a portable impact attenuator attached to the rear of a large truck. Ballast is added to the truck to minimize the roll-ahead distance when impacted by a vehicle. The TMA is used as a shield to prevent errant vehicles from entering the work zone. If a TMA is not available, the use of a protective or shadow vehicle is still highly recommended.

Considerations:

- **Speed of Traffic** - Higher operating speeds leave less reaction time and impacts generally result in more severe injuries and damage. Therefore, the higher the operating speed the more probability that a TMA is necessary.

- **Type of activity** - Mobile, intermittent or stationary.

- **Duration of project.**

- **Roadway environment** - Access controlled vs. non-access controlled, urban vs. rural, and roadway geometrics. Access controlled facilities frequently give drivers a false sense of security since interruptions are not expected. Therefore, activities on freeways may be more susceptible to incidents than are activities on non-access controlled facilities, where drivers are generally more alert.

- **Traffic volumes** - More traffic means more worker exposure.

- **Exposure to special hazards** - Operations involving personnel on foot or located in exposed positions (for example, on the approved platform of a pickup truck placing cones or in a lift-bucket performing overhead operations) are particularly susceptible to high severity incidents.

- **Location of work area** - Locations of primary concern are those within the traveled lanes or within frequently used, all-weather, shoulders. Activities taking place within the traveled lanes are more likely to become involved in an incident than are shoulder activities.

- **Roll Ahead Distance** - The 30 foot roll ahead distance shown in the BUFFER DATA block on the TCPs is based upon a minimum 15,000 lb. vehicle weight impacting the TMA and is the recommended minimum distance to be used. A protective vehicle is recommended regardless if a TMA is available. If no TMA is used, the protective vehicle shall be strategically located in the field to shield workers and no specific roll ahead distance has been provided.

- **TMAs must be certified as NCHRP 350 compliant.**

6. **Portable Changeable Message Signs (PCMS):**

- Recommended for high speed, high volume roadways, or work operations that require a highly visible message.
- Shall ***not*** be used to replace required signs. Can be used to replace static message signs for short duration or moving operations, as per approved traffic control plan.
- Place in advance of other temporary traffic control zone signing.
- Shall meet the minimum visibility and legibility standards established in the MUTCD.
- Should be able to read the message twice at the posted speed.
- Each individual display should convey a single thought.
- A complete message cycle should consist of ***no more than two*** displays in sequence. Refer to MUTCD for a list of acceptable message abbreviations.
- Bottom of sign panel shall be a minimum of 7' above roadway.
- PCMS shall automatically adjust its light source relative to surrounding conditions.
- Messages shall not scroll horizontally or vertically across the sign face.
- Consider use of a truck mounted PCMS for protective vehicles.
- Consider use of permanently located changeable message signs when applicable.
- PCMS should be placed on the shoulder of the roadway, or if practical, further from the traveled lane. They should be delineated with traffic control devices or shielded with a barrier or crash cushion. When signs are not being used, they should be removed.

7. **Arrow Panel:**

- **Required for all lane closures on multi-lane roads, except during emergencies.**
- Arrow panels shall meet the minimum size, legibility, legibility distance, number of elements, and other specifications as shown in the MUTCD.
- An arrow panel shall not be used on a multi-lane roadway to laterally shift traffic.
- An arrow panel shall not be used on a two lane, two-way roadway.
- An arrow panel shall only be used in the caution mode when used for shoulder closures.

- Only the **four-corner flash** shall be used to indicate caution.
- Use ***only one*** arrow panel per lane being closed (unless used in mobile operations).
- Arrow panel should be used in combination with other appropriate traffic control devices. When arrow panels are not being used, they should be removed.
- Arrow panel shall be capable of a minimum 50 percent dimming.
- For stationary lane closure, the arrow panel should be located on the shoulder at the beginning of the taper. Where the shoulder is narrow, the arrow panel should be located in the closed lane.
- The arrow panel shall be located behind channelizing devices (unless used in mobile operations).
- An arrow display mounted on a shadow (early warning) vehicle is allowed on mobile lane closure operations.
- Type "C" arrow panels are required for high-speed stationary lane closures. Type "B" arrow panels are allowed for mobile lane closures. (See MUTCD Part 6F)

8. **Channelizing Devices:**
   Traffic safety cones are the most common devices used to separate and guide traffic past a work area. Cones must be 18" tall, except for high speed, high volume, or nighttime operations, where they must be 28" tall, and retro-reflectorized. Traffic safety drums must be 36" tall, and are recommended for use in the tapers on high-speed roadways due to their greater visibility and imposing size. Maximum spacing requirements are shown on the TCP's. The Table on page 18 is provided to help select the proper taper lengths and number of devices needed. Tighter spacing may be desirable, under some conditions, to enhance motorists' guidance. Refer to Appendix 4-4, page 89, Channelizing Device Matrix, for additional guidance.

9. **Temporary Concrete Barrier:**
   Temporary concrete barrier is designed to prevent intrusion of errant vehicles into work areas. Recommended for long-term stationary work areas with high exposure to traffic. Refer to the WSDOT design manual and contact the Region Traffic Office Staff for site specific placement information.

   Consider the following for use of concrete barriers:

- Areas where there is a high potential for injury to workers or "no escape" areas such as internal lane work, work zones in tunnels, bridges, lane expansion work, etc.

- Long term, stationary jobs (work occupying a location for more than 3 days).

- Areas of high exposure to workers and motorists such as high speed and high volume of traffic.

- The approach ends of temporary concrete barriers shall be fitted with impact attenuators to reduce the potential for occupant injury during a vehicle collision with the barrier. Examples of impact attenuators are shown in Design Manual Chapter 720.

10. **Water Filled Barrier:**
Water filled barriers are longitudinal barrier systems that use light weight modules pinned together and filled with water to form a barrier. They are ***not intended*** as a replacement for concrete barrier but are an improvement over traffic cones and drums to channelize traffic through a work zone. In emergency maintenance situations, they may be considered for short-term use as a substitute for concrete barrier.

Contact the Region Traffic Office, or HQ Design Office, for advice on use of this device and assistance in determining the deflection space requirement behind the barrier.

11. **Barricades:**
Generally used to protect spot hazards but can also be used to close roadways and sidewalks with appropriate signing. Barricades can also be used to provide additional protection to work areas.

12. **Warning Lights:**
These lights are either flashing or steady burn (Types A, B, or C or strobe) mounted on channelizing devices, barriers and signs. Secure warning lights to the channelizing device or sign so they will not come loose and become a dangerous flying object if impacted by a vehicle. See the MUTCD, Part VI for additional information.

- Type A – low-intensity flashing warning light used to warn road users during nighttime hours they are approaching a potentially hazardous area.
- Type B – high-intensity warning light used to warn road users during both daylight and nighttime hours.
- Type C – steady-burn warning light designed to operate 24 hours per day to delineate the edge of the roadway.

13. **Flares:**
All work vehicles should carry a supply of flares. Use flares only to alert drivers to emergencies and not as routine traffic control device. Emergencies are defined as unexpected events where life threatening conditions, injuries or property damage may occur unless immediate action is taken. Use caution at accident sites where flammable materials, such as fuel spills, are suspected.

Consider the following for use of flares:

- Primarily used in high hazard conditions only (i.e. accidents, spills, equipment breakdowns, dangerous snow and ice conditions, etc.)

- Use electronic flares or orange/red-glow sticks instead of incendiary flares where flammable materials are suspected.

14. **Temporary and Portable Signal Systems:**
Temporary traffic control signals are typically used in work zones to control traffic such as temporary one-way operations along a one-lane, two-way highway where one lane is closed and alternating traffic movements are necessary. Examples of work operations are temporary one-way operations on bridges and intersections. Contact the region traffic office and signal

superintendent for specific guidance and advice on the use of these systems. A traffic control plan is required for use of these systems.

- Temporary signal system - typically a permanent signal system modified in a temporary configuration such as temporary pole locations during intersection construction, span wire systems, adjustment of signal heads to accommodate a construction stage.

- Portable traffic signal system – a trailer mounted traffic signal used in work zones to control traffic. These versatile, portable units allow for alternative power sources such as solar power, generator and deep cycle marine batteries in addition to AC power.

15. **Highway Advisory Radio (HAR):**
Roadside radio system that provides traffic and traveler related information (typically affecting roadway being traveled) via AM radio. The system may be a permanently located transmitter or a portable trailer mounted system that can be moved from location to location as necessary. Contact the region traffic office and signal superintendent for specific guidance and advice on the use of these systems.

16. **Specific Warning Sign Requirements**

Examples:

- Abrupt Lane Edge
- Motorcycles Use Extreme Caution
- Bump
- Traffic Revision Ahead
- Road Narrows
- Grooved Pavement
- Rough Road
- Loose Gravel
- No Shoulder
- Water Over Roadway

Not all warning signs are shown on the traffic control plans but are required to address specific work zone hazards when conditions warrant, particularly if the hazard is not obvious or cannot be seen by approaching motorists.

17. **Personal Protective Wear:**
The wearing of soft caps is **permitted in accordance with the WSDOT Employee Head Protection Instructional letter IL 4011.05 and the Personal Protective Equipment Chapter of the Safety Procedures and Guidelines Manual. Hard hats are required when working on or around the following:**

- Asphalt Plant, Crushers, Blasting Area, and Asphalt grinding operations.
- Construction of bridges, structures, retaining walls, etc.
- Overhead work such as working in a trench, rock-fall areas, sign installation, installing poles, work under bridges, electrical conductors, etc.
- Working near operating equipment with arms, booms, buckets, etc.
- Work around cranes, pile driving, drilling.
- During work as a flagger.
- Brush cutter work, danger tree work, and other logging operations.

- On any construction site whenever there is a potential exposure to danger from falling objects to persons working or occupying the area.
- Any designated hardhat area.

Supervisors have the authority to require employees to wear hard hats for other activities where there is a danger from impact and/or penetration of falling and flying objects. Employees must have a hard hat on site and readily available for use when work conditions require their use.

High Visibility Clothing
While working on foot in a highway right of way (fence line to fence line) or in other areas where job duties are performed in close proximity to moving vehicles, WSDOT workers must:

- Wear retro-reflective vests, except that during daylight hours, an orange T-shirt with two 2-inch wide yellow stripes front and back may be worn in lieu of the retro-reflective vest. Flaggers must wear retro-reflective vests and hard hats at all times.
- The retro-reflective vest shall always be the outermost garment.
- During hours of darkness, wear vests and either white coveralls or high visibility orange pants with 4 yellow strips.
- **Exceptions to these high visibility requirements:** (1) when personnel are out of view of, or not exposed to, traffic, (2) when personnel are inside a vehicle, or (3) where it is obvious that such apparel is not needed for employee safety from traffic.

The standard WSDOT vest is either:

- ANSI/ISEA standard Class II Fluorescent Orange-Red textured Woven polyester vest with Fluorescent lime yellow or ANSI approved equal strips from state contract,
- ANSI/ISEA standard Class II lightweight Fluorescent Orange-Red Mesh vest with Fluorescent lime yellow or ANSI approved equal strips from state contract, or
- ANSI/ISEA standard Class II Surveyors with Fluorescent lime yellow or ANSI approved equal strips from state contract.

A standard WSDOT approved T-shirt may be purchased by WSDOT employees and worn in lieu of the WSDOT Safety Vest by employees during daylight hours and when not working as a flagger. T-shirts shall not have any words or "ads" affixed to them. The WSDOT T-shirt standard requires a crew neck, base color orange, minimum 2 each 2" horizontal yellow bars on front and back with at least 2" apart vertically. The supervisor and/or Region Safety Officer shall have final approval authority over both the T-shirt itself and its use.

Contractor personnel working on WSDOT projects who are on foot in the highway right of way (fence line to fence line) or in other areas where job duties are performed in close proximity to moving vehicles, should:

- Wear retro-reflective vest, except that during daylight hours, clothing of orange, yellow, strong yellow green or fluorescent versions of these colors may be worn in lieu of vests. Flaggers must wear the retro-reflective vests and hardhat at all times.

- The retro-reflective vest shall always be the outermost garment.

- During hours of darkness, wear retro-reflective vests and white coveralls or high visibility ANSI class II coveralls or ANSI class E pants.

- When contractor workers wear rain gear it shall be yellow or high visibility orange with yellow strips.
- Exceptions to these high visibility requirements: (1) when personnel are out of view of, or not exposed to, traffic, (2) when personnel are inside a vehicle, or (3) where it is obvious that such apparel is not needed for employee safety from traffic.

Flagging

- Flagging should be employed only when all other methods of traffic control are inadequate to direct, or control, traffic.
- Locate the flagger off the traveled portion of the roadway. More than one flagger may be necessary to achieve traffic control in both directions. A means of communication between flaggers must be considered in these situations. Communication by hand held radio is the recommended procedure.
- Only persons who have successfully completed an approved flagging course and who possess current flagging certification recognized in Washington State can be used as flaggers.
- Freeway characteristics do not lend themselves to effective flagging. High speed multiple lanes and normal driver expectancy do not provide an opportunity for the flagger to actually warn or direct traffic, therefore flagging on freeways and freeway ramps is not normally recommended. However, using a "*spotter*" may be helpful to protect the work crew.
- In a mobile flagging operation, all signs associated with the flagger shall be moved ahead whenever work advances to more than 2 miles from the advance warning signs; also, **the "flagger ahead (symbol or text message)" sign is recommended to be within 1,500 feet of the flagger, any time a flagger is deployed.**
- During hours of darkness flagger stations shall be illuminated without causing glare to the traveling public.
- When flagging in the vicinity of signalized intersections special consideration must be made to address the specific needs to traffic movements. The signal must be either turned off or set to red "flash" mode. At no time shall traffic be flagged with an active signal.
- The placement of a flagger at the center of an intersection to control traffic is not allowed, the only person allowed to legally control traffic from the center of an intersection is a uniformed police officer. See Appendix 1-1, pages 73-81, Flagger Safety bulletin for additional information.

Flagger's Rules of Conduct

1. Be clearly visible to approaching traffic at all times.
2. Do not stand in front of parked/stopped cars.
3. Always be aware of oncoming traffic.
4. Do not step into, or turn your back on the traffic.
5. Stand on the shoulder of the road observing traffic and the work zone. You may have to stand on the opposite side of the road to effectively direct traffic around the work.
6. Choose the best flagging position that will provide the greatest color contrast between you and the background.
7. If at all possible, do not stand in the shade.
8. Never flag from inside a vehicle.
9. Do not lean, sit or lie on a vehicle.
10. Stand alone. Do not permit a group of workers to congregate around you.
11. Familiarize yourself with the nature of the work being performed. Be able to answer motorists' questions. Be aware of the work in progress.
12. Establish a warning signal with the work crew in case of an emergency.
13. Plan an escape route in case of an emergency.
14. Stay alert! Be ready to respond to an emergency.
15. Record the license number and description of any vehicle whose driver disobeys your instructions and threatens the safety of the work area. Report information to authorities.
16. Be courteous and professional.
17. Keep your mind on your job; do not do any other work when flagging.
18. Do not involve yourself in unnecessary conversation with workers, pedestrians, or motorists.
19. Do not leave your position until you are appropriately relieved.
20. Cover, turn or remove the "FLAGGER AHEAD" sign when a flagger is no longer on duty.
21. Always carry your flagger certification card while on the job.

Pedestrians, Bicycles and Other Roadway Users

Give consideration to pedestrian and bicycle traffic where appropriate. Provide alternative routes where designated walkways or bicycle routes are temporarily interrupted due to work operations. Alternative routes need to be free of obstructions and hazards (e.g., holes, debris, mud, construction and stored equipment, etc.). Clearly delineate all hazards near or adjacent to the path (e.g., ditches, trenches, excavations, etc.). Refer to MUTCD Part VI, Chapter 6D for additional requirements.

Pedestrians:

Most public highways and streets cannot deny access to pedestrians if no other route is available to them. All pre-existing ADA compliant pedestrian facilities within the work zone must continue to comply with ADA requirements for barrier-free access during work operations. Consider the following when addressing pedestrian issues within and around work zones:

- Pedestrians should not be led into conflicts with work site vehicles, equipment, and operations.

- Pedestrians should not be led into conflicts with vehicles moving through or around the work site.
- Pedestrians should be provided with a safe, convenient path that replicates as nearly as practical the most desirable characteristics of the existing sidewalks or a footpath.
- Pedestrians generally will not go out of their way. Make alternate pathways reasonable.
- Do not place signs and other traffic control devices within the pathway that may pose a hazard.
- **Placement of sidewalk closure signs shall be provided in advance of the closure point for pedestrians to make adjustments to their route. It must be recognized that pedestrians are reluctant to retrace their steps to a prior intersection for a crossing.**

Bicycles:

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

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, milled asphalt and tapers from existing pavement down to milled surfaces. Adequate signing to warn for these conditions to alert the motorcycle rider are required. See TCD2, page 67, for a typical signing layout example.

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
- Bus movements for loading and unloading students
- Coordination with crossing guards
- School hours to minimize impacts

Oversize Loads

Oversized vehicles may exceed the legal width, height, or weight limits for vehicles, but are still allowed to travel on certain state highways. Motor Carrier Services office issues permits that allow the oversized vehicles to use these routes and in some areas the region maintenance office also issues permits. If the proposed work zone will not accommodate over legal vehicles, then additional warning signs are necessary and notification of the motor carrier

services and the region's maintenance offices that issue these permits so they are aware of the restrictions. On some projects, it may be necessary to designate a detour route for oversized vehicles. A specific and specialized TCP should be considered to address oversize load conflicts and this information must be shared with the Motor Carrier Services office for their use in processing permits. Contact the region traffic office for assistance in determining and developing detour route plans.

Additional Work Zone Considerations

Work Zone Speed Limits

The speed limits on state highways are set by the State Traffic Engineer and cannot be changed without approval. Only use reduced legal speed limits when the safe operating speed of the roadway determines the need to do so. Safety issues such as access points, sight distance, poor roadway condition and reduced geometric features are some examples of issues that may apply. Speed reduction guidelines are outlined in RCW 47.48.020, the WSDOT Construction Manual (M41-01), and WSDOT Directive D55-20, "Reduced Speed in Maintenance and Construction Work Zones."

Do not reduce speed limits based on the hope that traffic will slow down when there is no driver perceived need to do so. Proposals to reduce the speed limit for work zones must be submitted to the region traffic office for consideration and Regional Administrator approval.

Worker Protection

Working on or along the highway can present a potentially hazardous work environment. Consider the risk to workers when developing the traffic control plans. See Appendix 5-5, page 91-93, WSDOT instructional letter for worker safety on paving projects. An assessment of worker safety should be made prior to beginning work operations.

Survey Work Zones

The guidance and tcp's contained in this guidebook do not reflect a specific type of work operation, which is consistent with the principles of Part VI of the MUTCD. It is intended that survey crews will follow the guidance shown in this guidebook to accommodate their work needs. Survey crews are not allowed any additional flexibility than other work crews to conduct work operations in a safe manner as intended within the established rules and guidance. However, tcp's 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.

Coordination

Accurate and timely reporting of work zone information to the public is a valuable element in the overall traffic control strategy. The use of public information resources, such as newspapers, radio and television can greatly improve the public's perception and acceptance of the necessary delays and other inconveniences caused by the project's construction. Issues to consider are:

- Emergency services coordination so they are aware of the project 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.
- Special events, be aware of special events that may conflict with the operation and make adjustments to work hours if necessary. Coordinate with event to minimize impacts.
  The region's public information officer can provide assistance in the coordination effort.

Road Closures

Closing a highway, street, or ramp, while not always practical, is a desirable option from a safety viewpoint. For the traveling public, closing the road for a short time might be less of an inconvenience than driving through a work zone for an extended period of time.

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 and WSDOT Directive M55-20, the Regional Administrator may close a road, street, or ramp.

If a road closure is feasible, take the following actions:

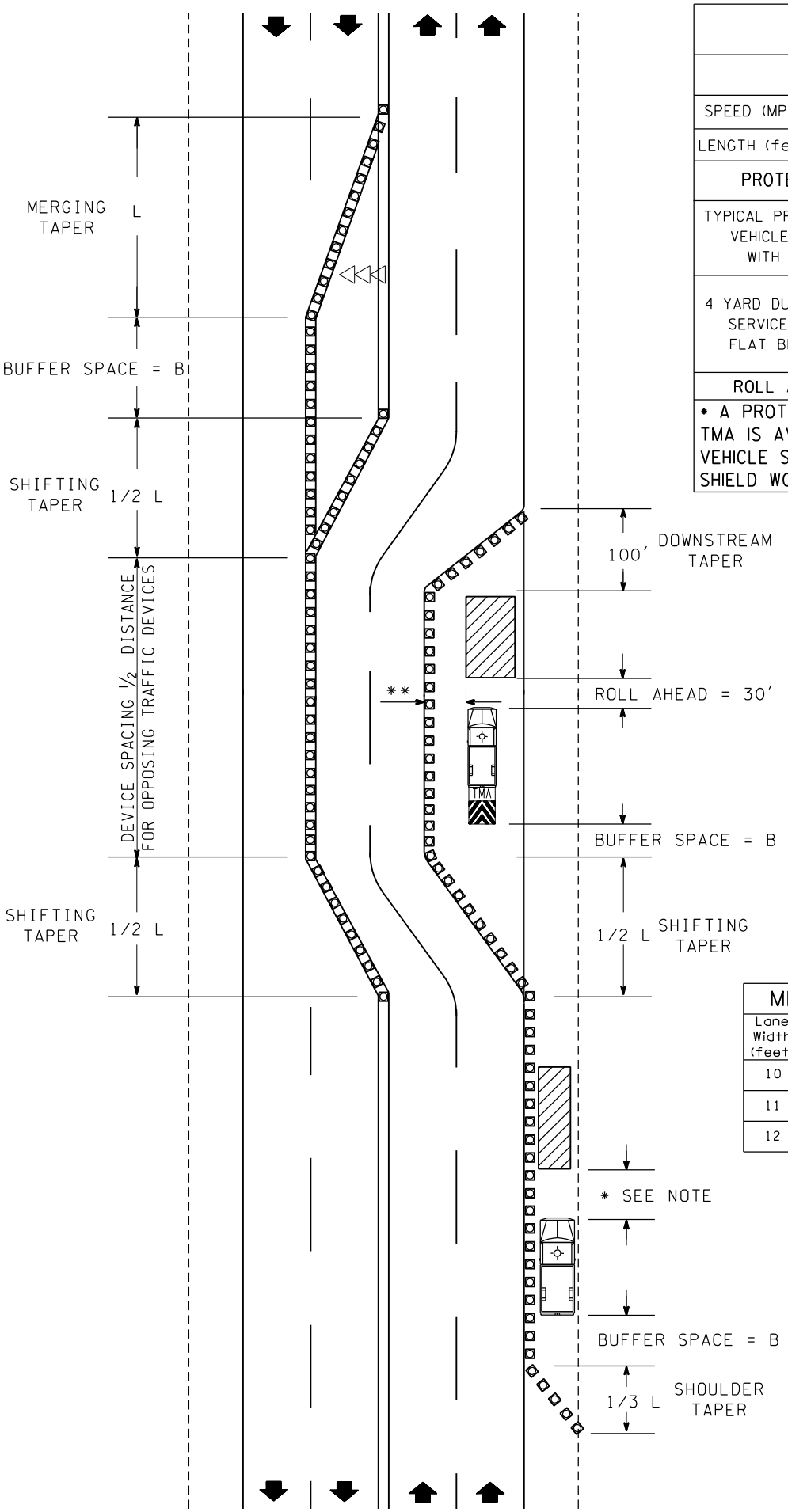
- Obtain local agency approval; consult with region local programs office.
- Determine maximum number of days allowed for the closure.
- Determine if additional traffic control measures are needed at intersections on the detour route.
- Contact emergency services, schools, and transit organizations, etc.
- Coordinate with the region public information officer for assistance with public notification.

Short-term closures may be allowed without advance public notification for emergencies or off-peak closure (night closure). Check with the region traffic office prior to implementing a closure.

CHECKLIST FOR ESTABLISHING A TEMPORARY TRAFFIC CONTROL ZONE*

COMPLETED	ITEM
☐	Determine the duration of work, (Stationary, Short-Duration, Mobile)*
☐	Select hours of work to avoid peak periods (refer to region work hour chart when applicable)*
☐	Select the appropriate layout(s), using duration, type of roadway, volume, and speed, from guidelines.
☐	Determine any modifications to typical layout(s). • Check decision sight distance • Include intersections and driveways • Allow for buffer space free of obstructions
☐	Check the condition of devices (Refer to Quality Guidelines Booklet).
☐	Install devices beginning with the first device the driver will see. Device spacing and layout as per chart shown on TCP's.
☐	Conduct a drive through to check for problems.
☐	Document temporary traffic control zone, problems and major modifications to the layouts.
☐	Maintain devices while in place.
☐	Remove the devices as soon as work is completed, beginning with the last device placed.

*Utilize the Region Traffic Office Staff to address concerns and questions.



BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN.
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT		

* A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

** LATERAL BUFFER SPACE
A LATERAL BUFFER SPACE OF 2 FEET IS RECOMMENDED FOR HIGH SPEED WORK ZONES.

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

MINIMUM TAPER LENGTH (L) IN FEET										
Lane Width (feet)	Posted Speed (mph) 25	30	35	40	45	50	55	60	65	70
10	105	150	205	265	450	500	550	-	-	-
11	115	165	225	295	495	550	605	660	-	-
12	125	180	245	320	540	600	660	720	780	840

LEGEND

- SEQUENTIAL ARROW SIGN
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE WITHOUT TMA - RECOMMENDED
- PROTECTIVE VEHICLE WITH TMA - RECOMMENDED

TAPER AND BUFFER SPACE DETAILS

TAPER / CHANNELIZING DEVICE TABLE

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

**L for shoulder taper equals Shoulder Width x Speed. Figures shown are for a 10' shoulder.*

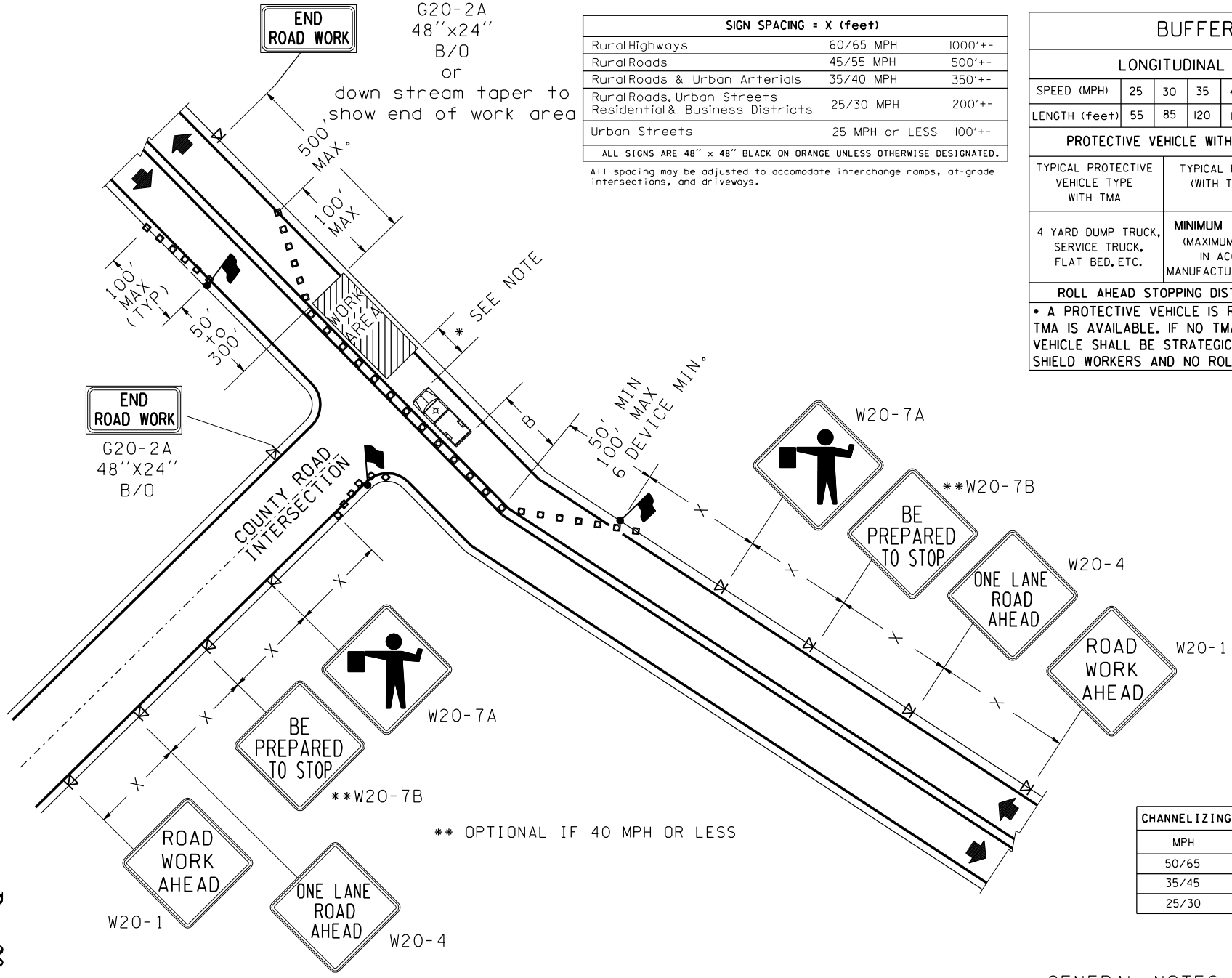
** The number of channelizing devices listed is the minimum required. Use of more devices should be considered if additional delineation is desired.

STATIONARY WORK ZONES

Traffic Control Plans (TCP's) 1 to 13

Stationary work zones are used for work activities that exceed one hour but could last for several days. Signs and channelizing devices are required for stationary work zones. Devices, such as sequential arrow panels, barricades and protective vehicles, may also be used depending on the situation. For longer term projects, temporary concrete barriers or water filled barriers, temporary pavement markings and post mounted signs might be typical devices. Examples of stationary work zone operations include: light standard repair, paving, sign installation and bridge repair. Stationary work zone traffic control is usually associated with a substantial work operation that may have many workers, equipment, truck hauling and flagging. Traffic operation, all work activities, workers and flaggers must be incorporated into the work zone and provided for during planning and selecting the Traffic Control Plans (TCP's).

The following TCP's show typical stationary traffic control setups.



SIGN SPACING = X (feet)		
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
Urban Streets	25 MPH or LESS	100'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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

BUFFER DATA

LONGITUDINAL BUFFER SPACE = B

SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	-	-

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE

TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN.

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT

• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/65	40	80
35/45	30	60
25/30	20	40

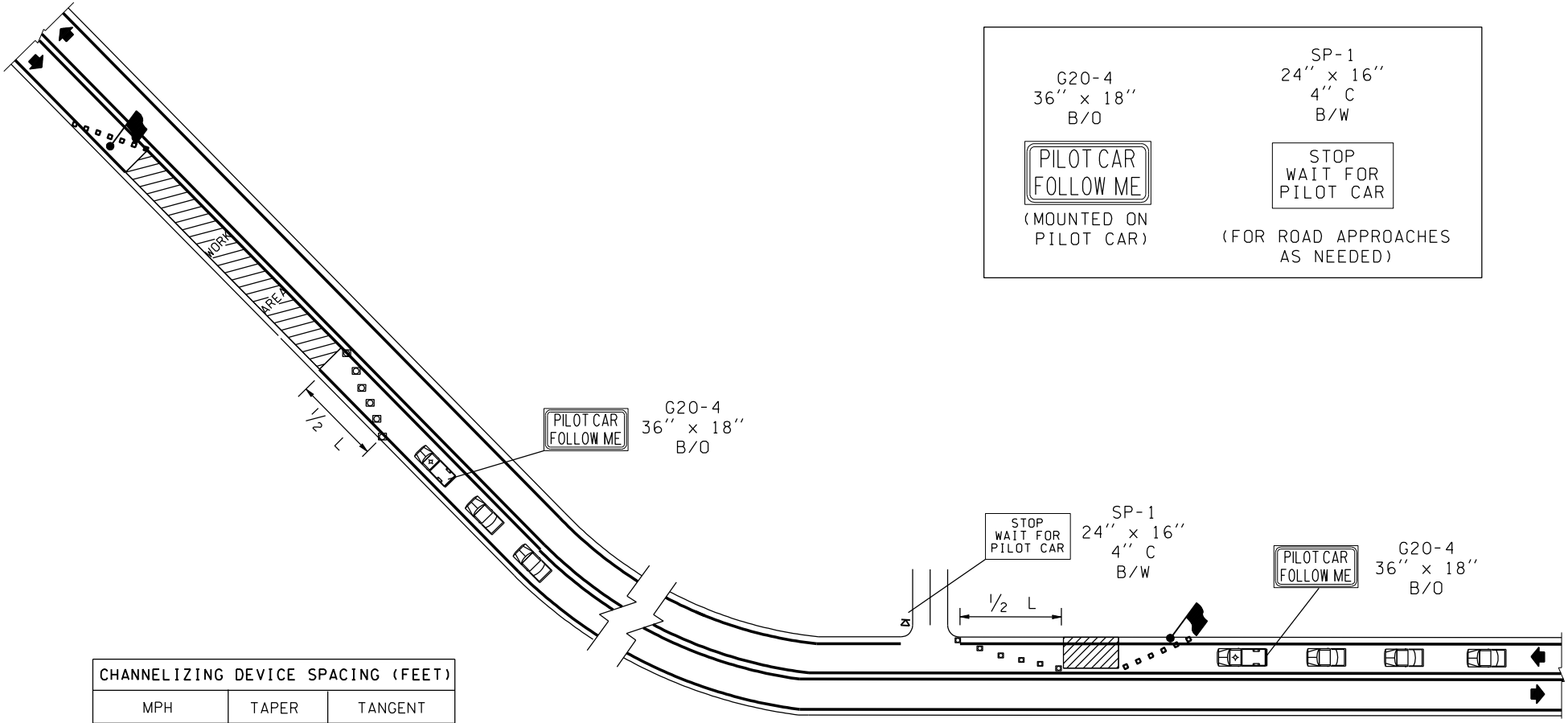
LEGEND

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

GENERAL NOTES

1. NIGHTWORK REQUIRES ADDITIONAL ROADWAY LIGHTING AT FLAGGING STATIONS, REFER TO WSDOT STD. SPECIFICATIONS FOR ADDITIONAL DETAILS.
2. RECOMMEND EXTENDING CHANNELIZING DEVICE TAPER ACROSS SHOULDER.
4. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
5. SIGN SEQUENCE IS THE SAME FOR BOTH DIRECTIONS OF TRAVEL ON THE ROADWAY.

ALTERNATING ONE-WAY TRAFFIC FLAGGER CONTROLLED TCP 1



CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/65	40	80
35/45	30	60
25/30	20	40

GENERAL NOTES

1. REFER TO SHEET TCP1 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 TO PROTECT ALL FLAGGING STATIONS.

LEGEND

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

PILOT CAR OPERATION
TCP 2

BUFFER DATA

LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN.
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT		

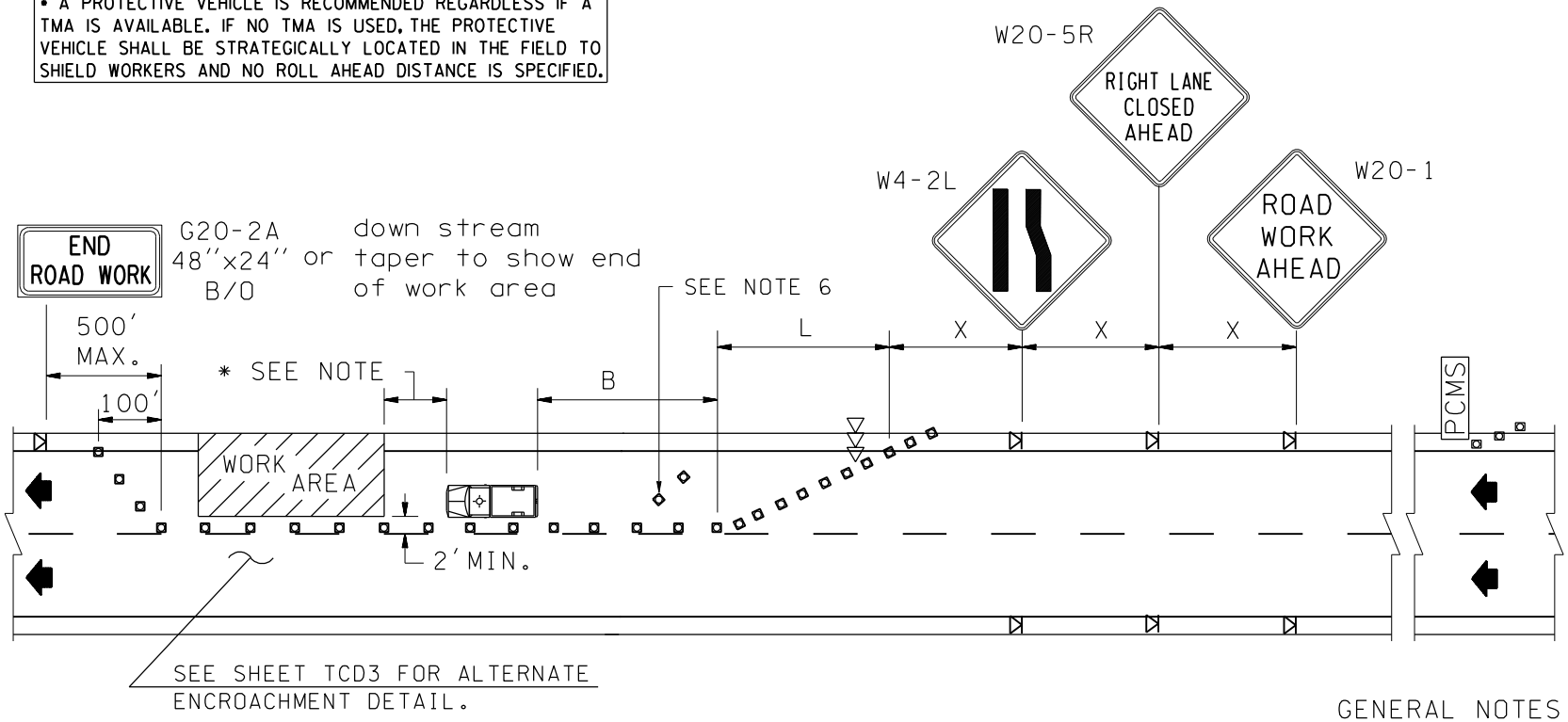
• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

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

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
Urban Streets	25 MPH or LESS	100'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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



(SAMPLE MESSAGE)

PCMS	
1	2
LANE CLOSED	1 MILE AHEAD
1.5 SEC	1.5 SEC

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

SEE SHEET TCD3 FOR ALTERNATE ENCROACHMENT DETAIL.

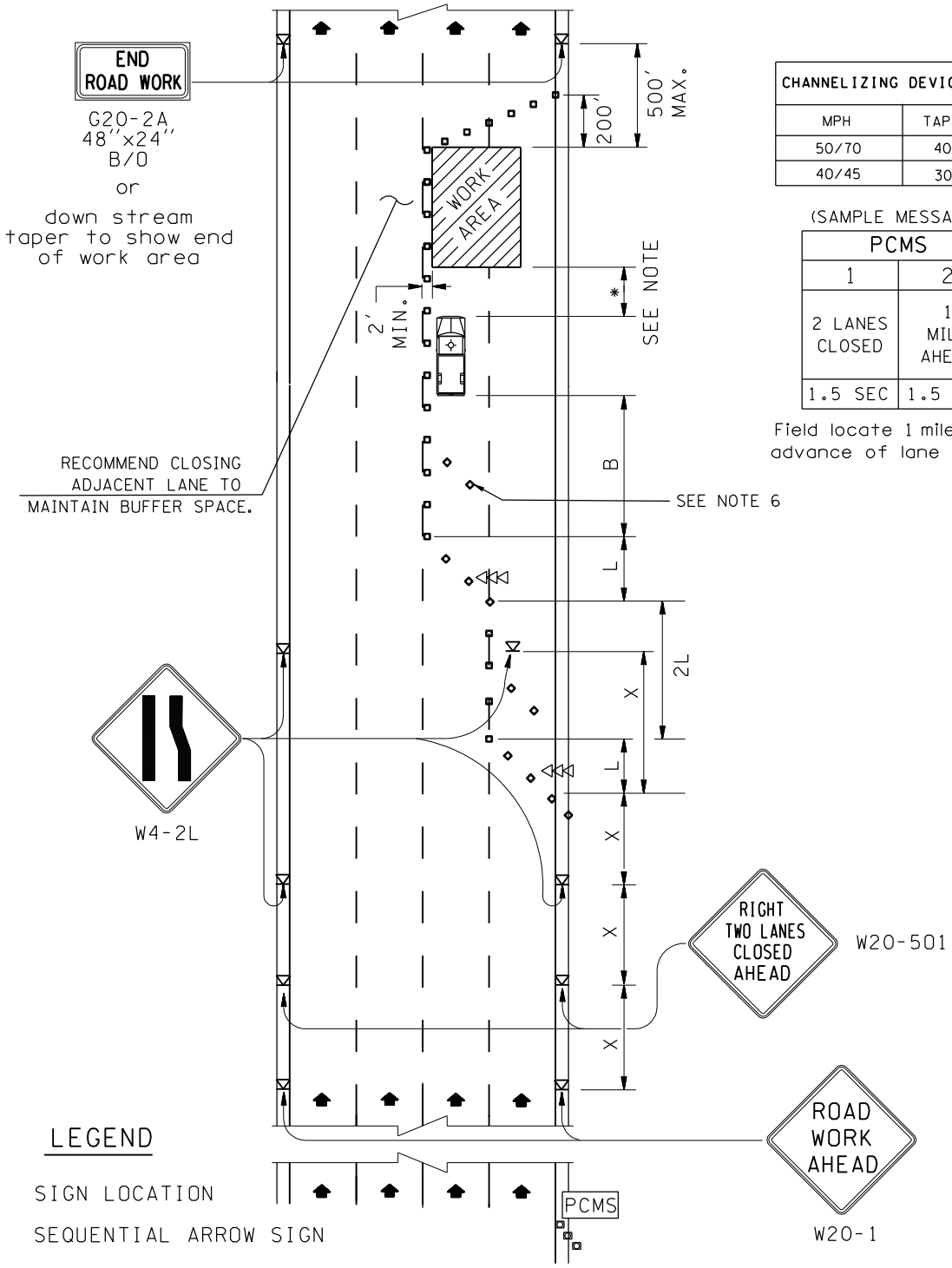
LEGEND

- SIGN LOCATION
- SEQUENTIAL ARROW SIGN
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN

GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
2. CONTACT REGION TRAFFIC OFFICE FOR WORK HOUR RESTRICTIONS.
3. RECOMMEND EXTENDING DEVICE TAPER ACROSS SHOULDER.(L/3 TAPER)
4. DEVICES SHOULD NOT ENCROACH INTO ADJACENT LANES.
5. PCMS RECOMMENDED.
6. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000'+- (RECOMMENDED).
7. TRAFFIC SAFETY DRUMS RECOMMENDED FOR ALL TAPERS ON HIGH SPEED ROADWAYS.(SEE DEVICE MATRIX)

SINGLE-LANE CLOSURE FOR MULTI-LANE ROADWAYS TCP 3



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

(SAMPLE MESSAGE)

PCMS	
1	2
2 LANES CLOSED	1 MILE AHEAD
1.5 SEC	1.5 SEC

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

BUFFER DATA

LONGITUDINAL BUFFER SPACE = B

SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE

TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN.

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT

• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

MINIMUM TAPER LENGTH (L) IN FEET

Lane Width (feet)	Posted Speed (mph) 25	30	35	40	45	50	55	60	65	70
10	-	-	-	265	450	500	550	-	-	-
11	-	-	-	295	495	550	605	660	-	-
12	-	-	-	320	540	600	660	720	780	840

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
Urban Streets	25 MPH or LESS	100'+-

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

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

LEGEND

- SIGN LOCATION
- SEQUENTIAL ARROW SIGN
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN

GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
2. CONTACT REGION TRAFFIC OFFICE FOR WORK HOUR RESTRICTIONS.
3. RECOMMEND EXTENDING DEVICE TAPER ACROSS SHOULDER.(L/3 TAPER)
4. DEVICES SHOULD NOT ENCROACH INTO ADJACENT LANES.
5. PCMS RECOMMENDED.
6. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000'+- (RECOMMENDED).
7. TRAFFIC SAFETY DRUMS RECOMMENDED FOR ALL TAPERS ON HIGH SPEED ROADWAYS. (SEE DEVICE MATRIX)

DOUBLE-LANE CLOSURE FOR MULTI-LANE ROADWAYS TCP 4

BUFFER DATA

LONGITUDINAL BUFFER SPACE = B

SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	-	-	-	-	-	-

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE

TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30' MIN

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT

• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

SIGN SPACING = X (FEET)

Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential Business Districts	25/30 MPH	200'+-
Urban Streets	25 MPH or LESS	100'+-

All signs are 48"x48" black on orange unless otherwise designated.

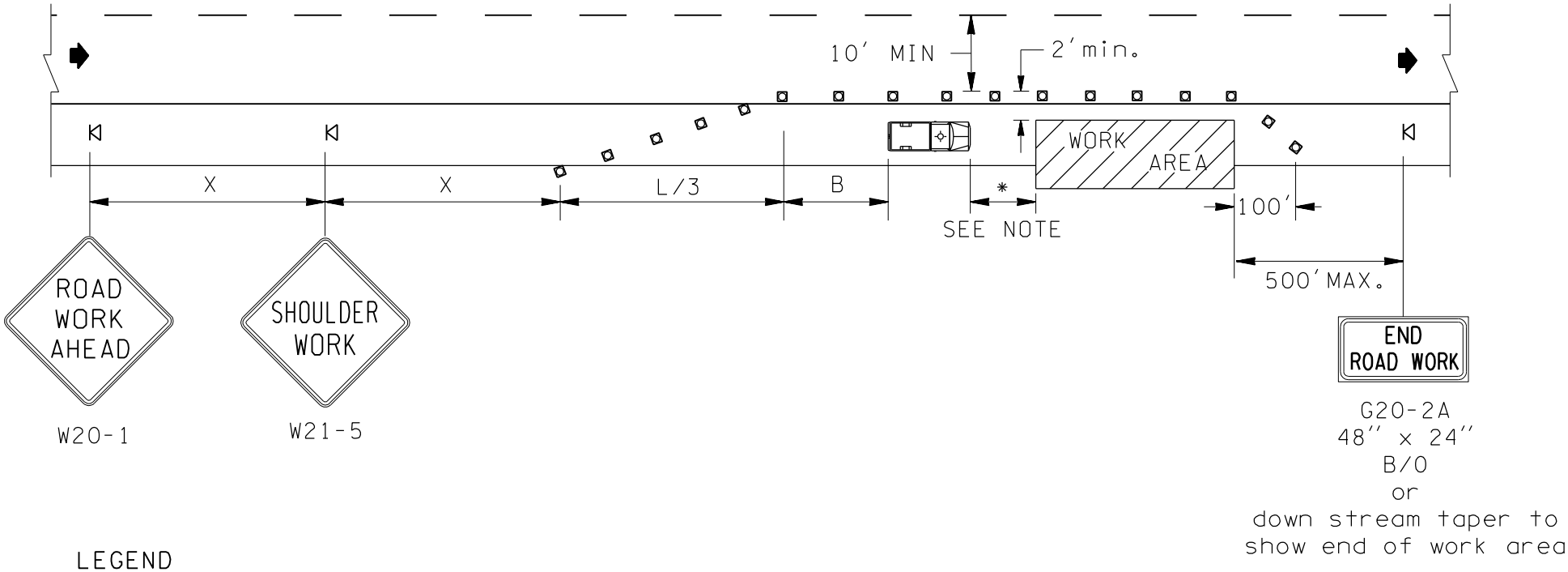
CHANNELIZING DEVICE SPACING (FEET)

MPH	TAPER	TANGENT
35/40	30	60
25/30	20	40

MINIMUM SHOULDER TAPER LENGTH IN FEET (L)

Shoulder Width (feet)	Posted Speed (mph) 25	30	35	40	45	50	55	60	65	70
6	63	90	123	165	-	-	-	-	-	-
8	84	120	162	210	-	-	-	-	-	-
10	105	150	204	270	-	-	-	-	-	-

3 DEVICES MINIMUM SPACED 10' O.C. IN TAPERS FOR SHOULDER WIDTHS LESS THAN 6 FEET



LEGEND

- SIGN LOCATION
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED

GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.

SHOULDER CLOSURE - LOW SPEED
TCP 5

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	-	-	-	-	220	280	335	415	485	585

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT		

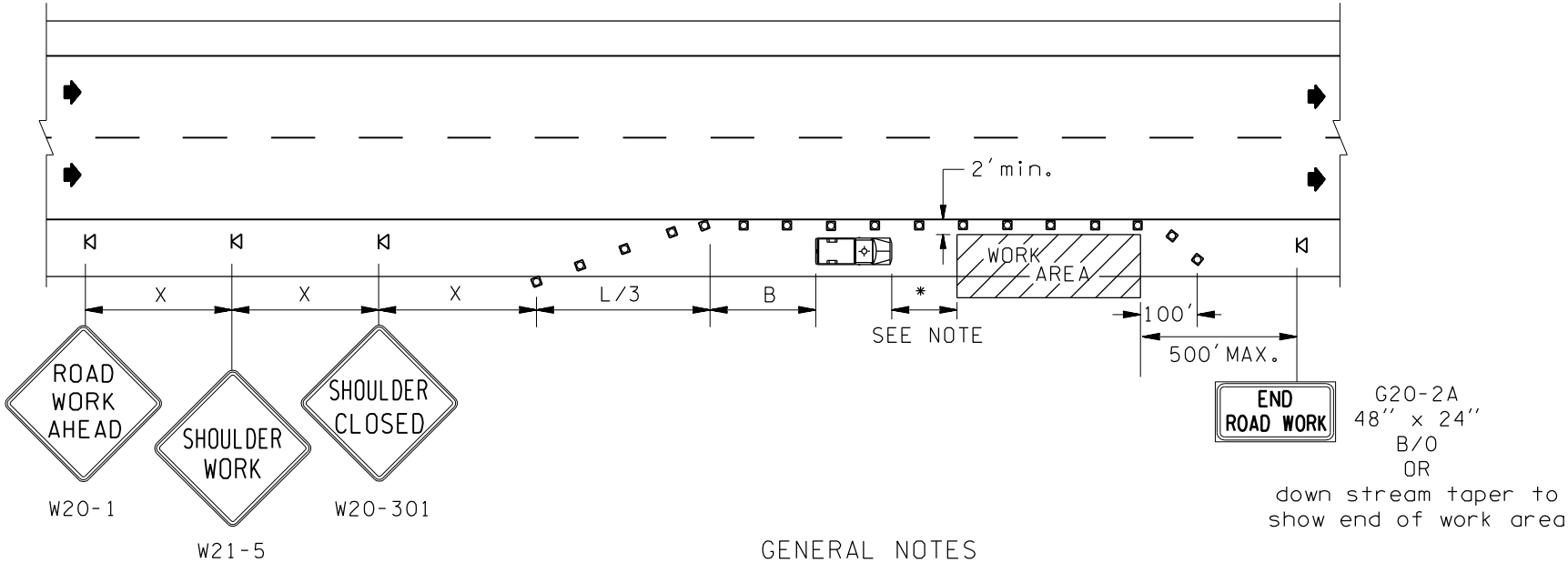
• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

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

MINIMUM SHOULDER TAPER LENGTH IN FEET (L)										
Shoulder Width (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
6	-	-	-	-	**270**	**300**	**330**	**360**	**390**	**420**
8	-	-	-	-	**360**	**405**	**450**	**480**	**525**	**570**
10	-	-	-	-	**450**	**510**	**555**	**600**	**660**	**705**
3 DEVICES MINIMUM SPACED 10' O.C. IN TAPERS FOR SHOULDER WIDTHS LESS THAN 6 FEET										

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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



LEGEND

SIGN LOCATION

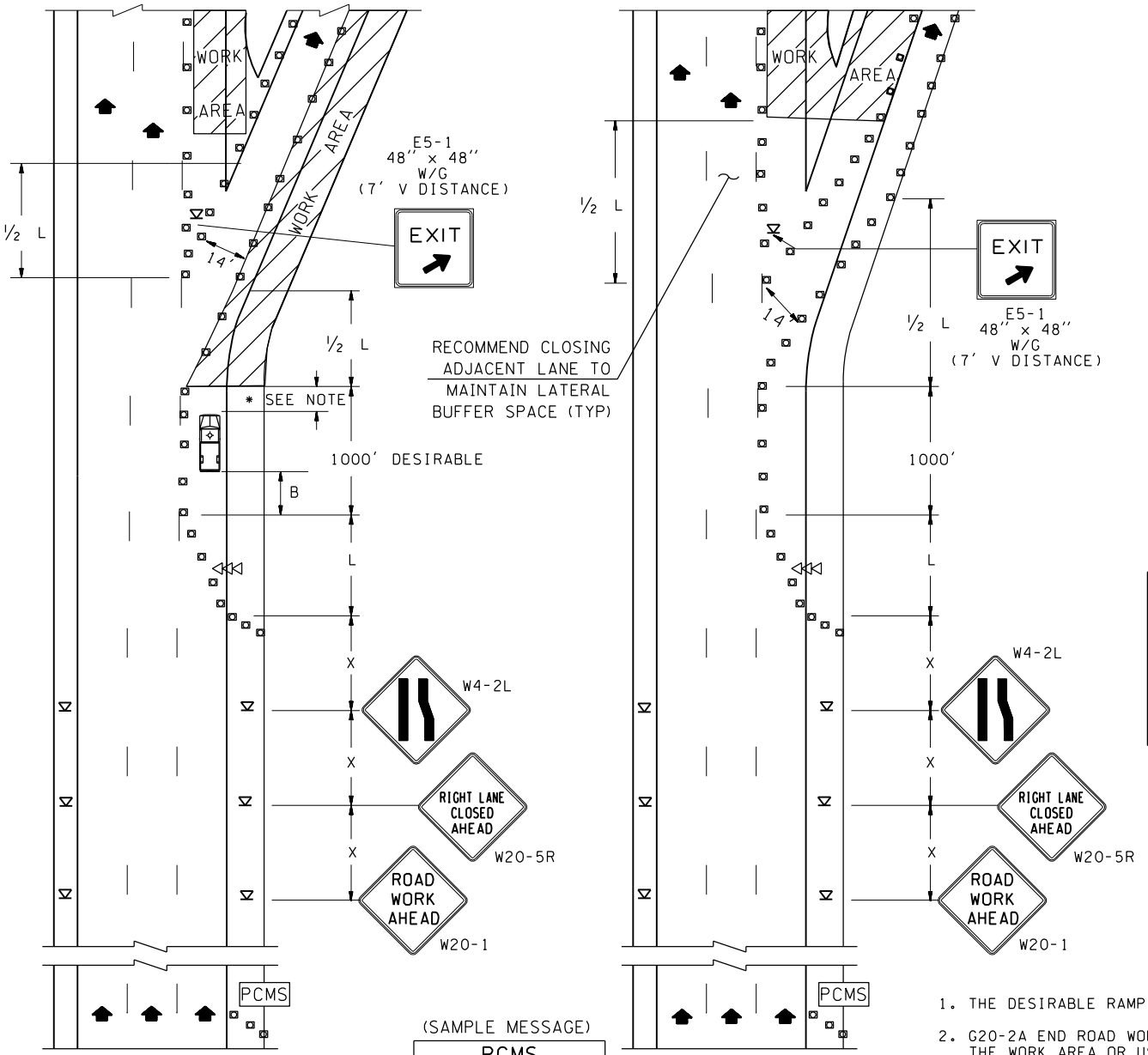
CHANNELIZING DEVICES

PROTECTIVE VEHICLE - RECOMMENDED

GENERAL NOTES

1. NO ENCROACHMENT ON TRAVELED LANE. IF ENCROACHMENT IS NECESSARY, LANE SHALL BE CLOSED.
2. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.

SHOULDER CLOSURE - HIGH SPEED
TCP 6



BUFFER DATA

LONGITUDINAL BUFFER SPACE = B

SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE

TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN.

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT

• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

MINIMUM TAPER LENGTH = L (feet)

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

SIGN SPACING = X (feet)

Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
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 accomodate interchange ramps, at-grade intersections, and driveways.

CHANNELIZING DEVICE SPACING (FEET)

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

(SAMPLE MESSAGE)

PCMS	
1	2
LANE CLOSED	1 MILE AHEAD
1.5 SEC	1.5 SEC

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

LEGEND

- SIGN LOCATION
- SEQUENTIAL ARROW SIGN
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN (RECOMMENDED)

GENERAL NOTES

1. THE DESIRABLE RAMP WIDTH IS 14' AND A 20:1 RAMP TAPER.
2. G20-2A END ROAD WORK SIGN SHOULD BE INSTALLED 500' BEYOND THE WORK AREA OR USE A DOWN STREAM TAPER.
3. CONTACT REGION TRAFFIC OFFICE FOR WORK HOURS RESTRICTIONS.
4. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
5. RECOMMEND EXTENDING CHANNELIZATION DEVICE TAPER ACROSS SHOULDER. (L/3 TAPER)
6. DEVICES SHOULD NOT ENCROACH INTO ADJACENT LANES.
7. TRAFFIC SAFETY DRUMS RECOMMENDED FOR ALL TAPERS ON HIGH SPEED ROADWAYS. (SEE DEVICE MATRIX)
8. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000' +- (RECOMMENDED)
9. CONSIDER SHORT TERM CLOSURE OF RAMP.

TEMPORARY OFF-RAMP FOR MULTI-LANE ROADWAYS TCP 7

BUFFER DATA

LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN.

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT

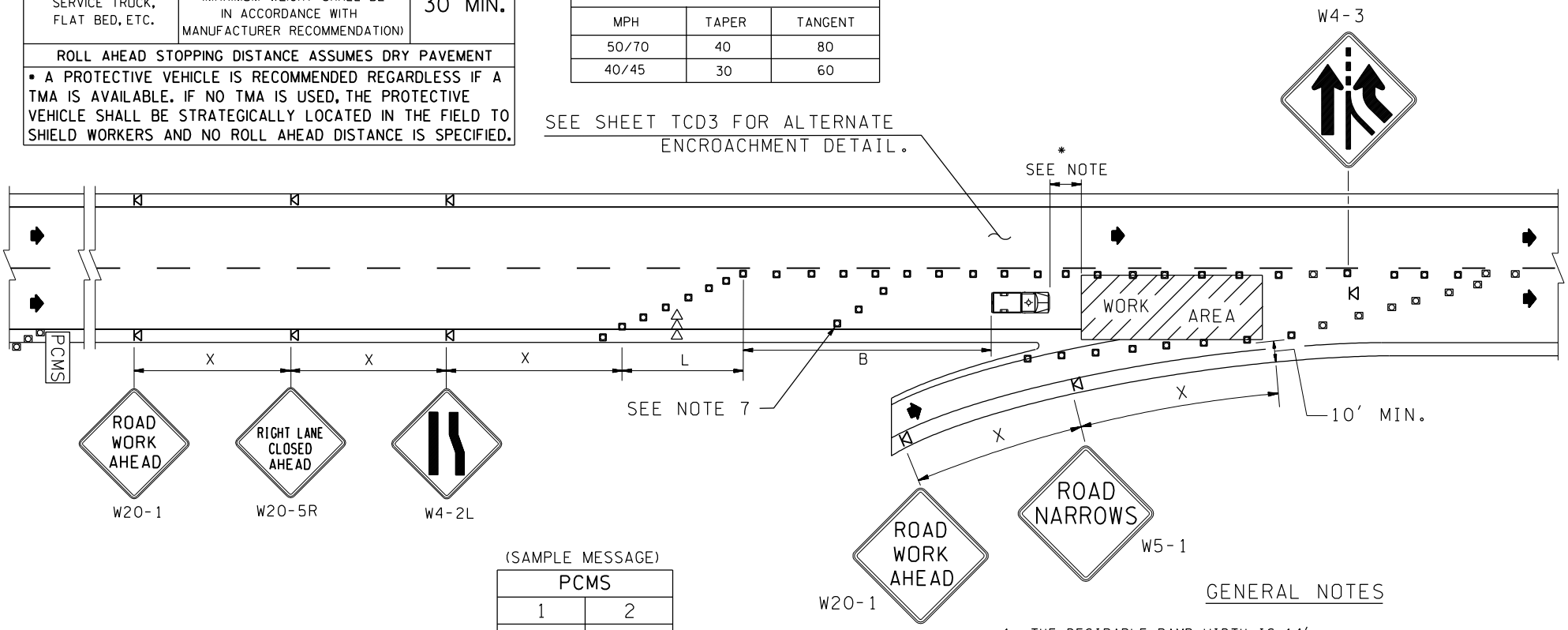
• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
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 accomodate interchange ramps, at-grade intersections, and driveways.

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

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



(SAMPLE MESSAGE)

PCMS	
1	2
LANE CLOSED	1 MILE AHEAD
1.5 SEC	1.5 SEC

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

LEGEND

- SIGN LOCATION
- SEQUENTIAL ARROW SIGN
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN (RECOMMENDED)

GENERAL NOTES

1. THE DESIRABLE RAMP WIDTH IS 14'.
2. A G20-2A END ROAD WORK SIGN SHOULD BE INSTALLED 500' BEYOND THE WORK AREA OR USE A DOWN STREAM TAPER.
3. CONTACT REGION TRAFFIC OFFICE FOR WORK HOUR RESTRICTIONS.
4. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
5. RECOMMEND EXTENDING CHANNELIZATION DEVICE TAPER ACROSS SHOULDER. (L/3 TAPER)
6. TRAFFIC SAFETY DRUMS RECOMMENDED FOR ALL TAPERS ON HIGH SPEED ROADWAYS.(SEE DEVICE MATRIX)
7. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000'+-. (RECOMMENDED)
8. DEVICES SHOULD NOT ENCROACH INTO ADJACENT LANES.
9. CONSIDER SHORT DURATION CLOSURE OF RAMP.

TEMPORARY ON-RAMP FOR MULTI-LANE ROADWAYS TCP 8

BUFFER DATA

LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	485	585

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN.
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT		

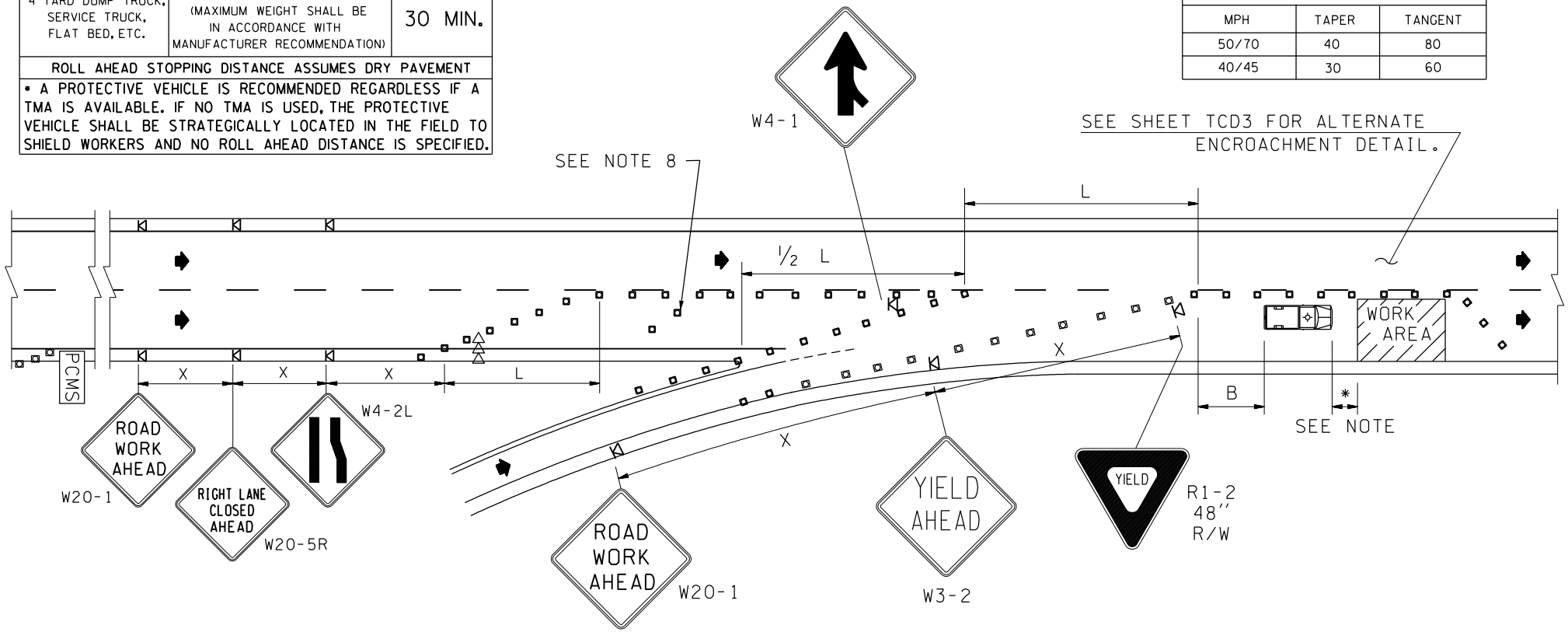
• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
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 accomodate interchange ramps, at-grade intersections, and driveways.

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

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



(SAMPLE MESSAGE)

PCMS	
1	2
LANE CLOSED	1 MILE AHEAD
1.5 SEC	1.5 SEC

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

GENERAL NOTES

1. THE DESIRABLE RAMP WIDTH IS 14'.
2. A G20-2A END ROAD WORK SIGN SHOULD BE INSTALLED 500' BEYOND THE WORKAREA OR USE A DOWN STREAM TAPER.
3. CONTACT REGION TRAFFIC OFFICE FOR WORK HOUR RESTRICTIONS.
4. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
5. RECOMMEND EXTENDING DEVICE TAPER ACROSS SHOULDER. (L/3 TAPER)
6. PCMS RECOMMENDED.
7. TRAFFIC SAFETY DRUMS RECOMMENDED FOR ALL TAPERS ON HIGH SPEED ROADWAYS. (SEE DEVICE MATRIX)
8. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000'+-. (RECOMMENDED)
9. CONSIDER SHORT TERM CLOSURE OF RAMP.

LEGEND

- SIGN LOCATION
- SEQUENTIAL ARROW SIGN
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN

TEMPORARY ON-RAMP FOR MULTI-LANE ROADWAYS TCP 9

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	-	-	-

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT		

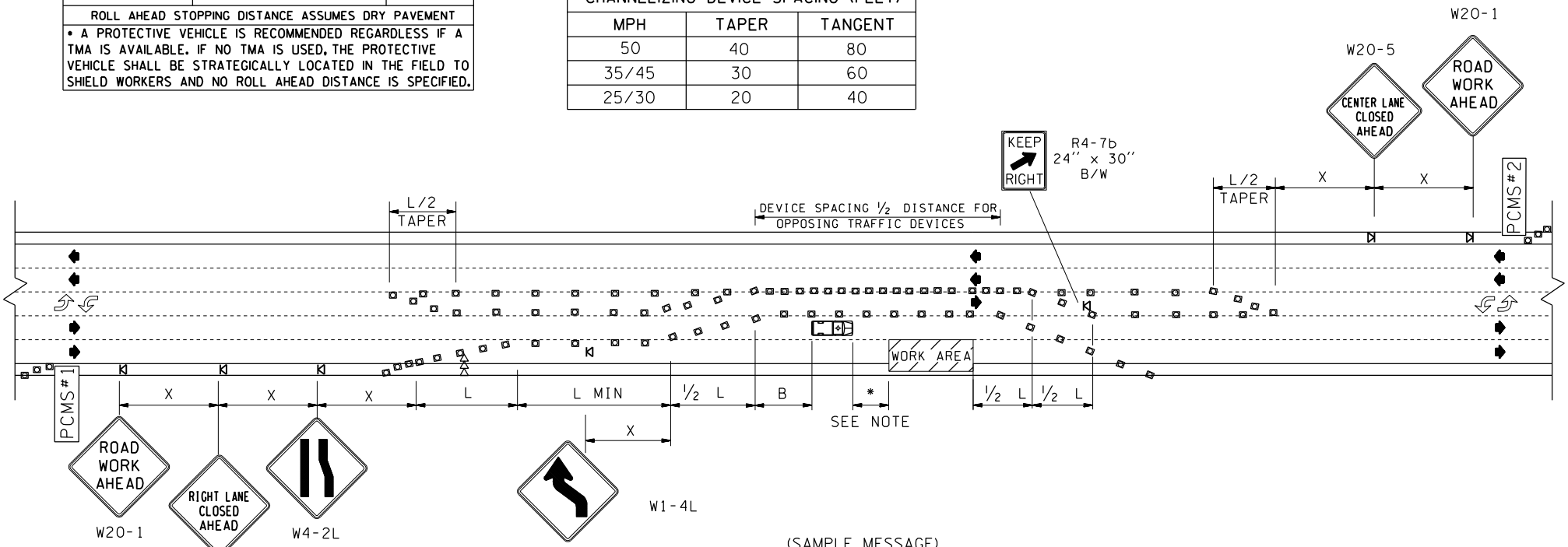
• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

SIGN SPACING = X (feet)		
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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

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	-	-	-
12	125	180	245	320	540	600	660	-	-	-

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



(SAMPLE MESSAGE)

PCMS #1	
1	2
RIGHT LANE CLOSED	NO LEFT TURNING
1.5 SEC	1.5 SEC

Field locate in advance of lane closure signing.

(SAMPLE MESSAGE)

PCMS #2	
1	2
CENTER LANE CLOSED	NO LEFT TURNING
1.5 SEC	1.5 SEC

Field locate in advance of lane closure signing.

LEGEND

- SIGN LOCATION
- SEQUENTIAL ARROW SIGN
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN

GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
2. RECOMMEND EXTENDING DEVICE TAPER ACROSS SHOULDER. (L/3 TAPER)
3. CONTACT REGION TRAFFIC OFFICE FOR WORK HOUR RESTRICTIONS.
4. IF THE LANE SHIFT IS SHORT AND HAS MINIMAL RADIUS CURVES (30 MPH OR LESS) USE SIGN W1-3 IN LIEU OF SIGN W1-4.
5. PCMS RECOMMENDED.

RIGHT LANE CLOSURE WITH SHIFT
5 LANE ROADWAY
TCP 10

BUFFER DATA

LONGITUDINAL BUFFER SPACE = B

SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	-	-	-	-

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE

TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	**MINIMUM WEIGHT 15,000 LBS.** (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN

ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT

• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

SIGN SPACING = X (feet)

Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-

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

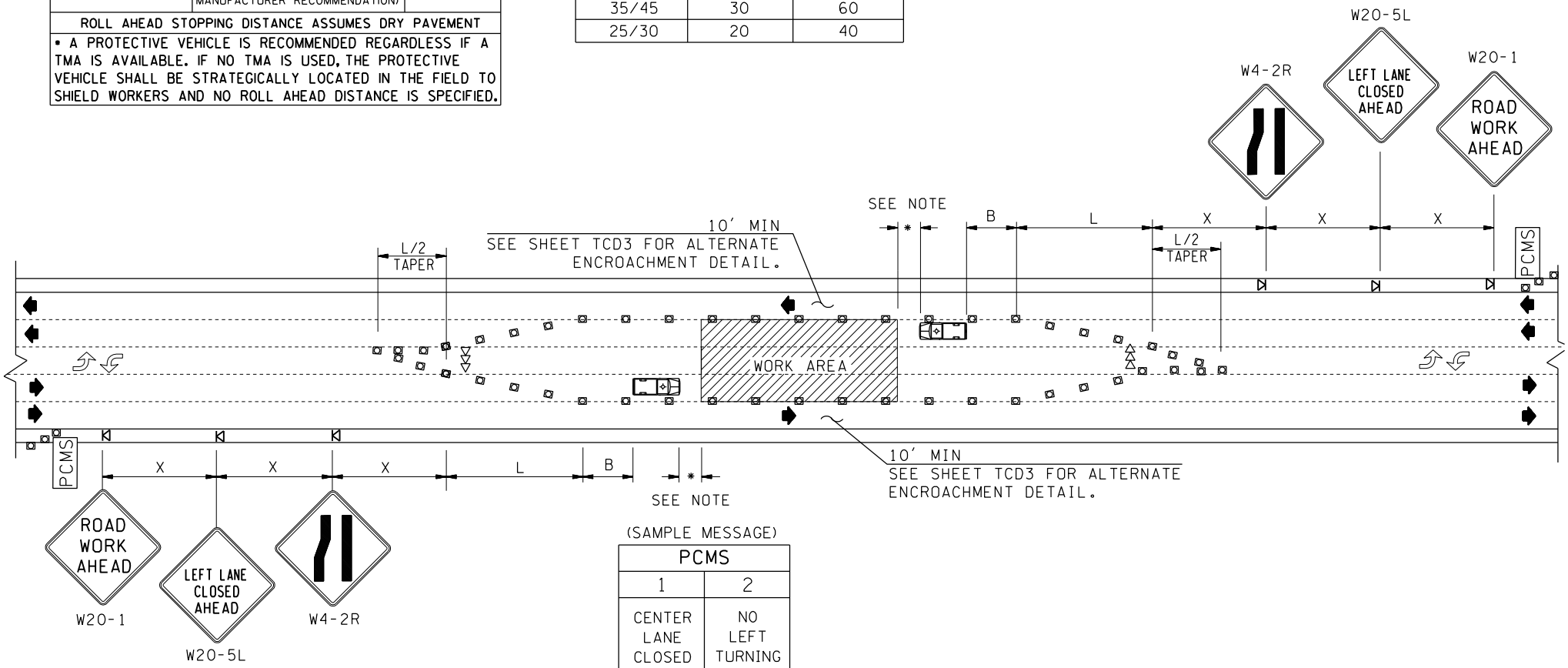
All spacing may be adjusted to accomodate interchange ramps, at-grade intersections, and driveways.

CHANNELIZING DEVICE SPACING (FEET)

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

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	-	-	-	-



(SAMPLE MESSAGE)

PCMS	
1	2
CENTER LANE CLOSED	NO LEFT TURNING
1.5 SEC	1.5 SEC

Field locate in advance of lane closure signing.

GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
2. CONTACT REGION TRAFFIC OFFICE FOR WORK HOUR RESTRICTIONS.
3. PCMS RECOMMENDED.

LEGEND

- SIGN LOCATION
- SEQUENTIAL ARROW SIGN
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN

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

BUFFER DATA

LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	-	-

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT		

• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

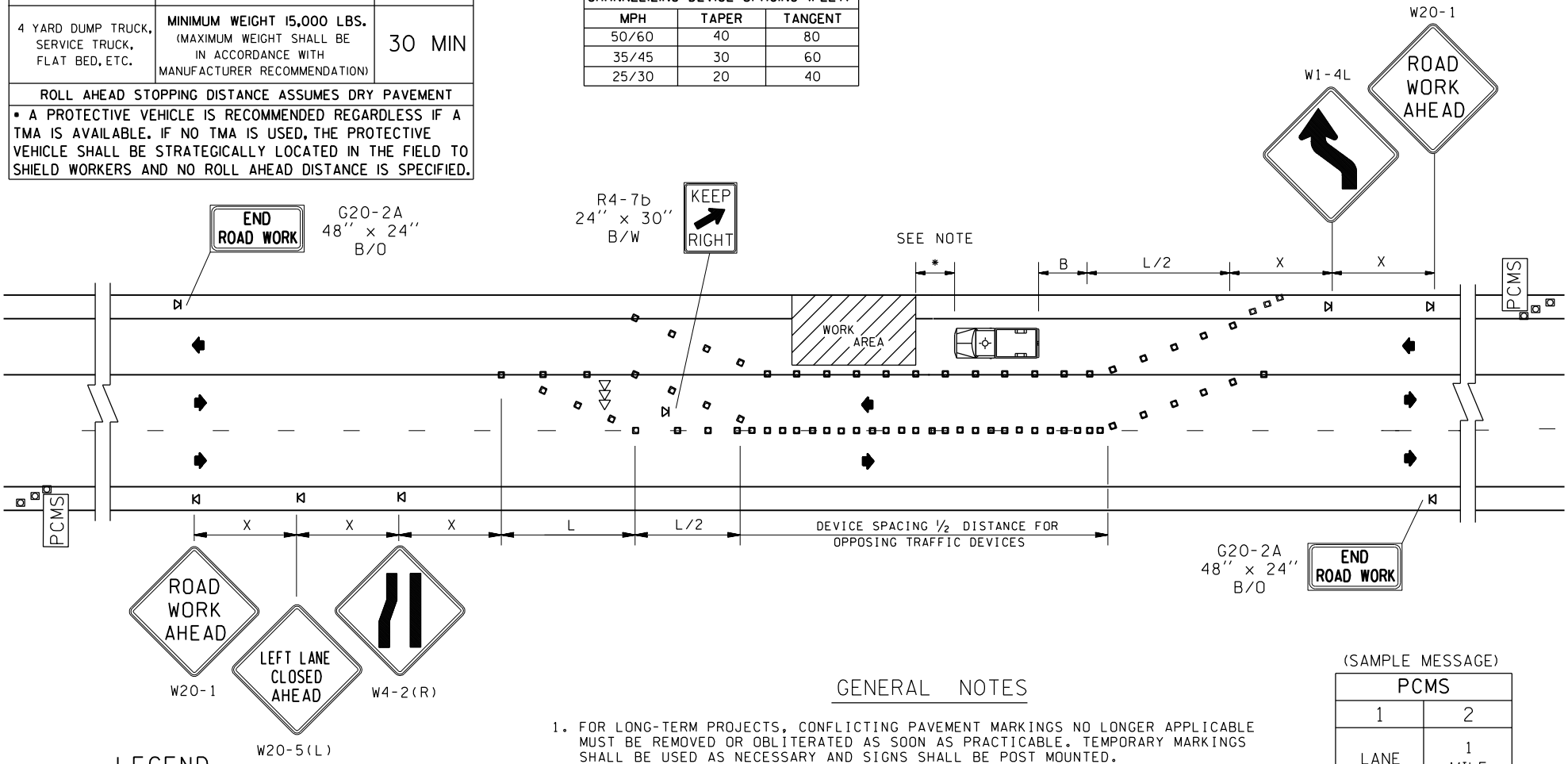
MINIMUM TAPER LENGTH = L (FEET)

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	-	-

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

SIGN SPACING = X (feet)		
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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



LEGEND

- SIGN LOCATION
- SEQUENTIAL ARROW SIGN
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN

GENERAL NOTES

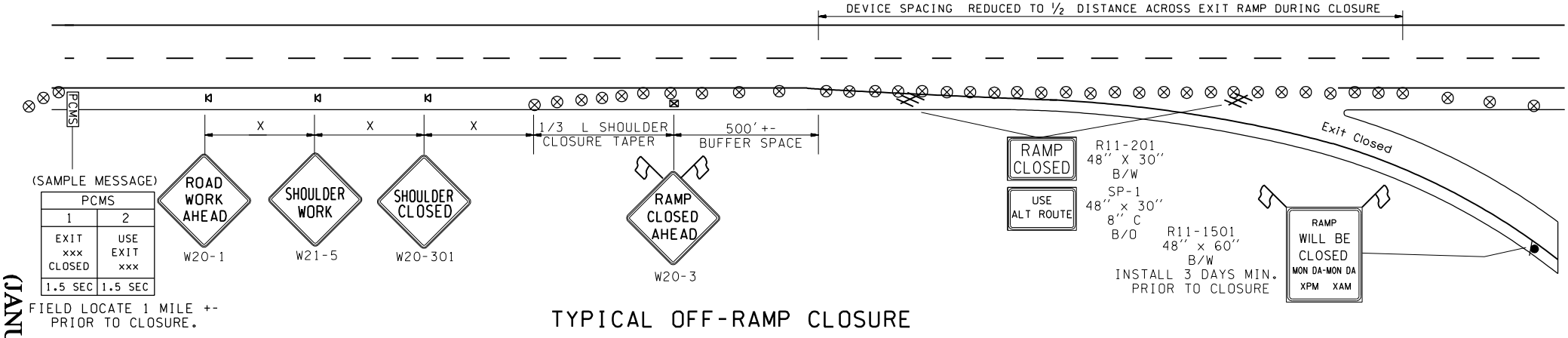
1. FOR LONG-TERM PROJECTS, CONFLICTING PAVEMENT MARKINGS NO LONGER APPLICABLE MUST BE REMOVED OR OBLITERATED AS SOON AS PRACTICABLE. TEMPORARY MARKINGS SHALL BE USED AS NECESSARY AND SIGNS SHALL BE POST MOUNTED.
2. STEADY BURN WARNING LIGHTS (TYPE C, MUTCD) SHOULD BE USED ON CHANNELIZING DEVICES AT NIGHT FOR DELINEATION.
3. FOR SPEED LIMITS OF 30 MPH OR LESS, USE SIGN W1-3 IN LIEU OF SIGN W1-4.
4. RECOMMEND EXTENDING CHANNELIZATION DEVICE TAPER ACROSS SHOULDER. (L/3 TAPER)
5. PCMS RECOMMENDED.

(SAMPLE MESSAGE)

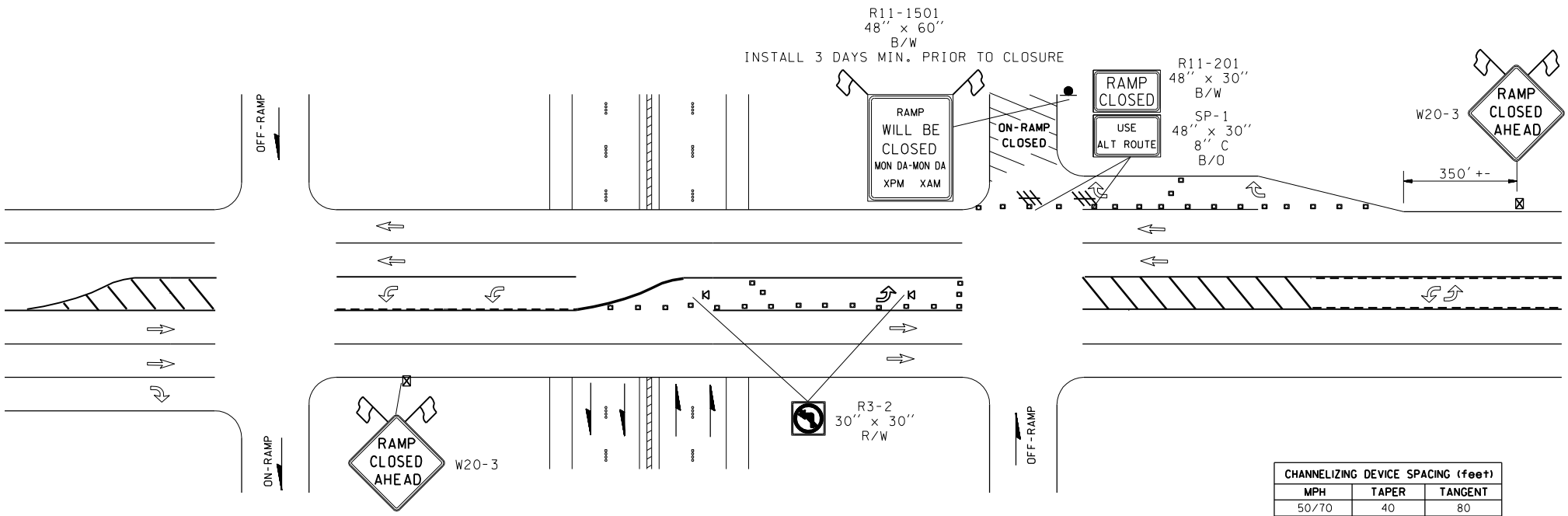
PCMS	
1	2
LANE CLOSED	1 MILE AHEAD
1.5 SEC	1.5 SEC

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

LANE SHIFT / THREE LANE ROADWAY
TCP 12



TYPICAL OFF-RAMP CLOSURE



CHANNELIZING DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

TYPICAL ON-RAMP CLOSURE

GENERAL NOTES

1. CONTACT REGION TRAFFIC OFFICE FOR WORK HOUR RESTRICTIONS
2. TYPICAL APPLICATION SHOWN, ADJUST FOR SITE CONDITIONS.

LEGEND

- PCMS — PORTABLE CHANGEABLE MESSAGE SIGN (RECOMMENDED)
- ⊗ TRAFFIC SAFETY DRUM
- SIGN LOCATION - TRIPOD MOUNT
- SIGN LOCATION - POST MOUNT
- CHANNELIZING DEVICE
- WARNING FLAG - FLUORESCENT RED/ORANGE
- ⊠ SIGN LOCATION - PORTABLE MOUNT - (7 FT MOUNTING HEIGHT)
- TYPE III BARRICADE

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

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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

TYPICAL SHORT TERM RAMP CLOSURES
TCP 13

SHORT DURATION WORK ZONES

Traffic Control Plans (TCP's) 14 to 20

Introduction

Short duration work zones are work activities up to 60 minutes. Due to the short work time, simplified traffic control set-ups are allowed to reduce the hazards of traffic exposure to workers. The time it may take to set up a full complement of signs and devices could approach or exceed the amount of time it requires to perform the work.

Short duration work zones provide a safety benefit for both drivers and workers since the time duration is less than implementation of stationary work zones thereby reducing exposure time to traffic and work hazards. Motorists also receive a mobility benefit from reduced traffic impacts and associated rear-ending congestion crashes. These safety and mobility benefits are consistent with the department's responsibility and policy to protect both drivers and workers while maintaining an acceptable level of mobility.

Careful consideration of traffic and roadway conditions must be given to each work zone prior to selecting the most appropriate traffic control set-up. Shoulder work and low-speed, low-volume traffic conditions may only require the use of the work vehicle hazard beacon and personal protective equipment. High-speed, high-volume lane work may require a full lane closure set-up, even though the work duration may be 60 minutes or less. Remember, short duration work is not a "short-cut", it's a traffic control method that reduces worker exposure to traffic hazards by using larger, more dominant and mobile equipment instead of many smaller devices (cones may still be recommended since they are quick to set up for small work zones).

Examples of short duration work zone operations include, re-lamping, pot hole repair, surveying, minor repairs, bridge inspection, field recon, pre-work layout, etc.

Guidance

The following guidance applies standards from the MUTCD to provide more specific direction to those involved in short duration work zones. The following provides decision making rationale to assist with selection of appropriate short duration traffic control and safety measures. Because of the complex and dynamic nature of all the elements involved in work zones the intent of this chapter is to assist supervisors and workers in decision making by resolving some of the confusion and subjectivity previously associated with short duration work zones. The included specific guidance and direction, rules, consideration chart and example TCP's should lead to an informed choice. Remember, there is no single solution that fits all work zones. Reliance on work zone training, including a working knowledge of this section combined with sound judgment of the site conditions is the foundation for safe and effective short duration work zones.

- Consider stationary work zone measures with a full compliment of signs and devices first. Some work operations, traditionally classified as short duration, may be able to be conducted as longer term stationary work by linking several work areas together

under a lane or shoulder closure. Advantages of linking work operations may include reducing exposure of workers to traffic, efficiencies in completing tasks concurrently, reducing the number of lane closures in the same area, and overall reduction in impacts to traffic.

- Consider mobile operations. Other short duration operations may be able to be conducted as mobile operations by progressing through several short duration work areas by making intermittent stops. Advantages are shortened work operations to install traffic control devices and improved worker safety through use of mobile equipment (TMA's, PCMS, mobile work vehicles, etc.) to reduce worker exposure to traffic hazards.

- Consider alternative work operations, materials and equipment, such as:

    - Work crews may be combined to accomplish work more effectively under mobile or stationary work zones, weekend or night closures, and other identified work locations or operations that may be difficult to accomplish with a small crew.

    - Identify "red zones" where short duration work zones are not a desirable choice due to poor traffic conditions (high volume, high speed, weaving areas, bridges, interchanges, etc.).

    - A specialized work zone traffic control crew could be considered for use to support work crew operations. The specialized team can provide a higher level of efficiency and safety for a work crew focused only on the work. This can also reduce the overall time duration, thereby reducing worker exposure to traffic hazards.

- Consider resources needed for unplanned short duration work (non-emergency)

These operations may be referred to as "call outs", not necessarily an emergency but a short notice response to a report of debris, repairs, or other situation where the exact nature of the work or location may not be completely known.

An on-site assessment may allow work to proceed with available equipment and devices. Strategic placement of the work vehicle with warning beacon is important. Devices and signs may also be needed. If work is expected to last more than 60 minutes additional resources may be needed to implement a traditional stationary work zone. Work may have to be delayed until the proper work zone equipment and devices are available. Assistance from region WSDOT Incidence Response may also be appropriate.

- Key elements of short duration work zones

    - Work Location – This element may be the most obvious but it is also the most important, at least initially, since it establishes the relationship to the next three elements. The location directly influences the assessment of hazards, protection

and warning. General roadway locations such as shoulders, lanes, medians, etc. are common but unique locations with narrow shoulders, bridges, undefined shoulders (no edge stripe), poor sight distance, tight radius curves, etc. require even more consideration.

- Hazards – This element is essential to determine and address safety hazards to workers and drivers. Traffic volume and speed is the primary hazard concern for workers in short duration work zones, while unexpected workers or equipment are the primary hazard for drivers. Assessment of all potential hazards at the work site is important to minimize the occurrence of an unexpected hazardous situation. Contingency plans and an escape route should be part of this assessment.

- Protection – This element establishes an appropriate level of worker protection based on assessment of the hazards involved. Positive worker protection is always recommended when practical but not necessarily required for less hazardous work zones. The use of a protective vehicle (work vehicle) can offer valuable worker protection in any work zone condition.

- Warning – This element provides for establishing the appropriate level of warning for drivers approaching and driving through the work zone. Advance warning to drivers is required when working within 15' of the edge of the roadway. In many short duration work zone locations the work vehicle warning beacon, assuming there is adequate sight distance, can provide this. Sign(s) may be needed for areas with reduced sight distance.

- Duration – This element is equally important as work location since it has a direct relationship to worker exposure to hazards. Duration also has the most influence over the other key elements. As mentioned in previous guidance, short duration work zones can offer safety and mobility benefits, but not at the risk of too much worker exposure to hazards.

• Short Duration Work Zone Condition

Short duration work zones are categorized into three relative condition types. This helps to establish a practical application level of traffic control and safety devices based on hazard, protection and warning levels related to work location and time duration. The MUTCD allows for simplified traffic control procedures for short duration work, but does not go into any detail on what those simplified procedures might be. Establishing a work zone condition level helps to answer the question; "Which traffic control and safety devices are appropriate for use as part of the allowed simplified procedures?"

The condition levels are:

- A - represents the lowest level of work zone impacts and is typified by:

    - Low traffic speed and volume.

- Time durations are short or very short, approximately 0 to 20 minutes. Work locations not within a traveled lane, such as shoulders, may be allowed up to 60 minutes.
- A wide variety of work locations may be encountered at this level.
- Minimum levels of warning, protection and hazards. A work vehicle with warning beacon and personal protective equipment may be adequate. See TCP's.

o B- represents moderate work zone impacts and is typified by:

- Low or high traffic speed with low to moderate volumes.
- Moderate time durations, approximately 0 to 40 minutes. Work locations not within a traveled lane, such as medians, may be allowed up to 60 minutes.
- A wide variety of work locations may be encountered at this level that may include median, gore, lanes and intersections.
- Moderated levels of warning and protection, such as a spotter, cones or PCMS added to condition "A" devices would be typical considerations. Refer to TCP's.

o C - represents the highest impact level and is typified by:

- High traffic speed and volume.
- Maximum time duration, up to 60 minutes.
- A wide variety of work locations may be encountered at this level, but all should be considered as presenting a significant hazard level even if time durations are short.
- All applicable traffic control and safety devices should be considered, such as PCMS, TMA's and signs. See TCP's.

While some of the elements within a particular work zone may not all exist within one condition, the relative types of elements that either identify the condition or are representative of those measures and values that could be applied to a work zone of that general condition level are shown. This is an important consideration for use, since it helps to clarify which types of devices could be applied to a work zone within practical time duration.

The short duration work zone condition level does not necessarily provide for a complete or final assessment, but it is a valuable tool for finding the best balance between time duration and the other work zone key elements. Time duration is an important consideration for short duration work zones; worker safety risk consideration cannot be ignored no matter how short the work time duration is. A common example of this condition is high-speed and high-volume traffic (urban freeway) with an in lane work location. Even though the work duration may be very short, work hazards as identified in condition "C" may need to be considered for mobile or stationary lane closures because the safety risk to workers and road users could be too great. Conversely, work zones typified by condition "A" may be allowed for longer (60 minutes maximum) duration since the safety risk to workers and road users is low.

- ## Work Zone Traffic Control Plans (TCP)

The example TCP's in this section are representative of several types of short duration work zones. The TCP's show the types of devices and equipment that can be applied for various work zone conditions. Work crews should review these TCP's for application and use in establishing their work zones. Additional TCP's should be developed to address work operations not covered by these TCP's.

No distinction is made as to the type of work operation for these TCP's. These TCP's are typical by nature and are adaptable to most work operations such as surveying, maintenance work, utility work and some minor construction operations. Unique work crews and operations may need more specific TCP's. The Region Traffic Offices can assist with TCP development.

- ## Short duration work zone rules

1. **When working in a live lane or intersection workers must be adequately protected and/or warned as appropriate for the work zone condition.**

    - Positive protection – TMA's, Buffer Vehicle, Barriers – (typically condition "C").
    - Lane closure – Channelizing devices, PCMS, etc. – (typically condition "B")
    - Spotter – Audible warning device or verbal as needed. – (typically condition "A" or "B" when working between adequately safe gaps in traffic. Sufficient warning allows worker to safely return to shoulder)
    - Escape routes/plans must be considered prior to starting work.

2. **Drivers must be adequately warned as they approach the work zone** – (see sight distance chart on TCP 27) Consider the following types of warning:

    - Flashing warning beacon on work vehicle
    - Warning signs
    - PCMS, Arrow Board (caution mode), Flag Tree or other approved dominant device.
    - TCP's and work zone condition dictate the specific level of warning required.

3. **Several intermittent work operations within a one-mile area lasting for more than 60 minutes should be considered for a mobile or stationary work zone and are not typically acceptable for short duration work zone operations**. **An assessment of the most effective and safe operation should be made.**

4. **Live traffic areas (lanes & intersections) in high speed and high volume work locations** may not be good candidates for short duration work zones since the conditions are not desirable for driver warning or worker protection. Work zone condition "C" would apply to most of these type of locations and may be acceptable

based on a positive site assessment and working only on the shoulder or adjacent lane as follows:

- **No unprotected work in interior lanes of multi-lane, (3 or more lanes) roads and no "island" work areas are allowed.**
- **Lanes of multi-lane roads may only be accessed from the adjacent shoulder.** (see TCP 19)
- **Intersections may be accessed following the same manner as above and consideration should be given to incorporating the existing intersection control into the work zone traffic control……..all red signal control or all way stop control may supplement the selected traffic control measures.** (see TCP's 28 & 29).

5. **Short duration flagging operations are not allowed.** All flagging requirements must be complied with and there currently is no exception for short duration work. Emergencies are the only exception to full flagging requirements. Flagging is defined by the MUTCD as stopping, directing or alerting road users. For the purposes of this section a spotter or worker may, and should be prepared to, warn or stop drivers of errant or unexpected vehicles, but not as a routine form of traffic control.

6. **A determination of a safe work location as it relates to acceptable worker exposure to potential traffic hazards 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? (shoulder, median, sidewalk, etc.)
   - Is there sufficient time for a worker to safely walk (not run) to and return from the work location? (across lanes to shoulder, into lane and back, etc., typically condition "A")
   - Are there other hazards (traffic or non-traffic) 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 chart TCP 27)

Understanding the intent and application of this section should provide valuable guidance while at the same time provide for the flexibility needed to respond to a wide variety of work operations. As with any work zone, worker safety and driver safety should be the first priority when planning for and conducting work operations. This is of even greater concern for short duration work zones since workers may be without the benefit of positive protection and extensive driver warning. Motorists may tend to encounter short duration work zones unexpectedly with a minimum of guidance and protection. Supervisors should be confident that the guidance of this section is understood and applied by their work crews, that worker and driver safety is acceptable or improved through the use of short duration work zones and that the balance between safety and work duration is appropriate.

Very Short Duration Work Zones

The overall guidance of the short duration work zone section of this guidebook applies to work zones that may last up to 60 minutes. However, it is important to recognize that many work actions or portions of work operations may take only a few seconds or minutes to perform. These types of actions might be:

- Debris retrieval; locating drainage structures or other roadway features or components
- Retrieval of lost cargo; work zone sign or device installation and removal
- Crash debris retrieval; a survey "shot", monument or other reference check
- Crossing or walking along the roadway, motorist assistance

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 they are not in conflict with traffic or other hazards and it is safe to do so. See the applicable rules of this section for worker safety and protection.

Very short duration work is typified by the following:

- The primary intent is not to conduct an actual work operation in total, but more related to gathering information, accessing a location, or a non-repetitive action as described above.

- Generally these actions occur at isolated locations or the locations are spaced far enough apart that they would constitute separate work zones.

- Equipment is usually not required, other than the possibility of simple hand tools.

Because of the very short duration and nature of these actions, there is a possibility that adequate work zone measures may not be fully considered by those involved or by supervisors. Even though these are very short duration actions, the key work zone elements must still be considered. High worker exposure locations, such as in a live lane and undesirable traffic conditions, such as high volumes, would still dictate the decision on implementing the appropriate work zone. It may be acceptable to perform some very short duration actions under work zone condition "A" & "B", with the minimum required equipment and devices. In most cases this would be a strategically placed work vehicle with warning beacon and personal protective equipment. It is recommended to apply more work zone safety measures if the level of safety can be raised without adding to worker exposure time. Working in teams of two, where one worker can act as a spotter from a safe location, may be a good example of an additional safety measure. The workers ability to maintain awareness of traffic conditions and potential hazards is a key concern.

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

Short Duration Work Zone Considerations Chart

This chart provides for a logical process to evaluate short duration work zones based on the five key elements described earlier and several related issues for each element. Consideration of these elements in a step-by-step process will help to ensure that an adequate assessment is made leading to selection of the appropriate traffic control and safety measures incorporated into the Traffic Control Plan (TCP). The chart alone does not provide for a complete or final decision on the level of traffic control and safety measures needed, but is a valuable tool for conducting the assessment and identifying issues that need to be addressed.

Step 1

Consider the work zone location

- Lane – traffic hazard, see TCP's for work zone details
- Intersection – traffic hazard, see TCP's for work zone details
- Median – potential traffic hazards on both sides
- Shoulder – consider narrow shoulders and potential for errant vehicles
- Off Roadway – traffic control is not required for work areas 15' or more off the roadway edge, but protection should be considered.

Step 2

Consider hazards to workers and road users

- Traffic – volume, speed, configuration, driver confusion
- Equipment – clearance to traffic, operator access
- Fall/Trip – clear worker path, barriers, obstacles
- Debris – crash, cargo, etc. (remove manually or equipment)
- Other – as determined at the site

Step 3

Consider worker protection measures

- Positive Protection – TMA, buffer/shadow vehicle (may be a work vehicle), barriers
- Devices – cones, drums, etc., may alert drivers and delineates work and traffic separation
- Spotter – effective to warn workers (requires safe location for spotter)
- Escape Route or Refuge – as part of a contingency plan for unexpected events

Step 4

Consider road user warning measures (may include guidance and protection as needed)

- Dominant Warning Devices – PCMS, Arrow board, flag tree
- Signs – advance warning message or specific to work operation

- Channelizing & Warning Devices – cones, drums, type A or B lights
- Vehicle Warning Beacon – requires adequate sight distance
- Protective Equipment – TMA, buffer/shadow vehicle (may be a work vehicle), personal protective equipment

Step 5

Consider time duration of work (directly related to worker & road user exposure to hazards)

- Low – 0 to 20 minutes
- Moderate – 0 to 40 minutes
- High – 0 to 60 minutes, consider stationary or mobile traffic control

High traffic volume and high-speed work locations require careful consideration of traffic control devices as shown on the typical TCP's regardless of how short the time duration may be.

Step 6

Consider which Short Duration TCP is appropriate for the work operation based on the previous 5 consideration steps and any other considerations that may be applicable. Also, consider the need to develop a new TCP if the example TCP's do not fit the work operation. Contact the Region Traffic Office for assistance.

SHORT DURATION WORK ZONES

DO'S and DON'TS

Don't –

- Take "short cuts" or hurry to accomplish work. Determination of all work zone hazards is a must.
- Run across or "dodge" traffic in live lanes.
- Work in a live lane under adverse traffic conditions or without proper traffic control in place……..even if it's only for a minute or few seconds.
- Assume that shoulder areas are automatically safe because you are not in a live traffic lane. Distracted, aggressive or impaired drivers may encroach into shoulder areas. Also, oversize loads may present a hazard.
- Turn your back to oncoming traffic if possible. Awareness of traffic is an important self-protection element.
- Put yourself in an unexpected location that may surprise a driver.

Do –

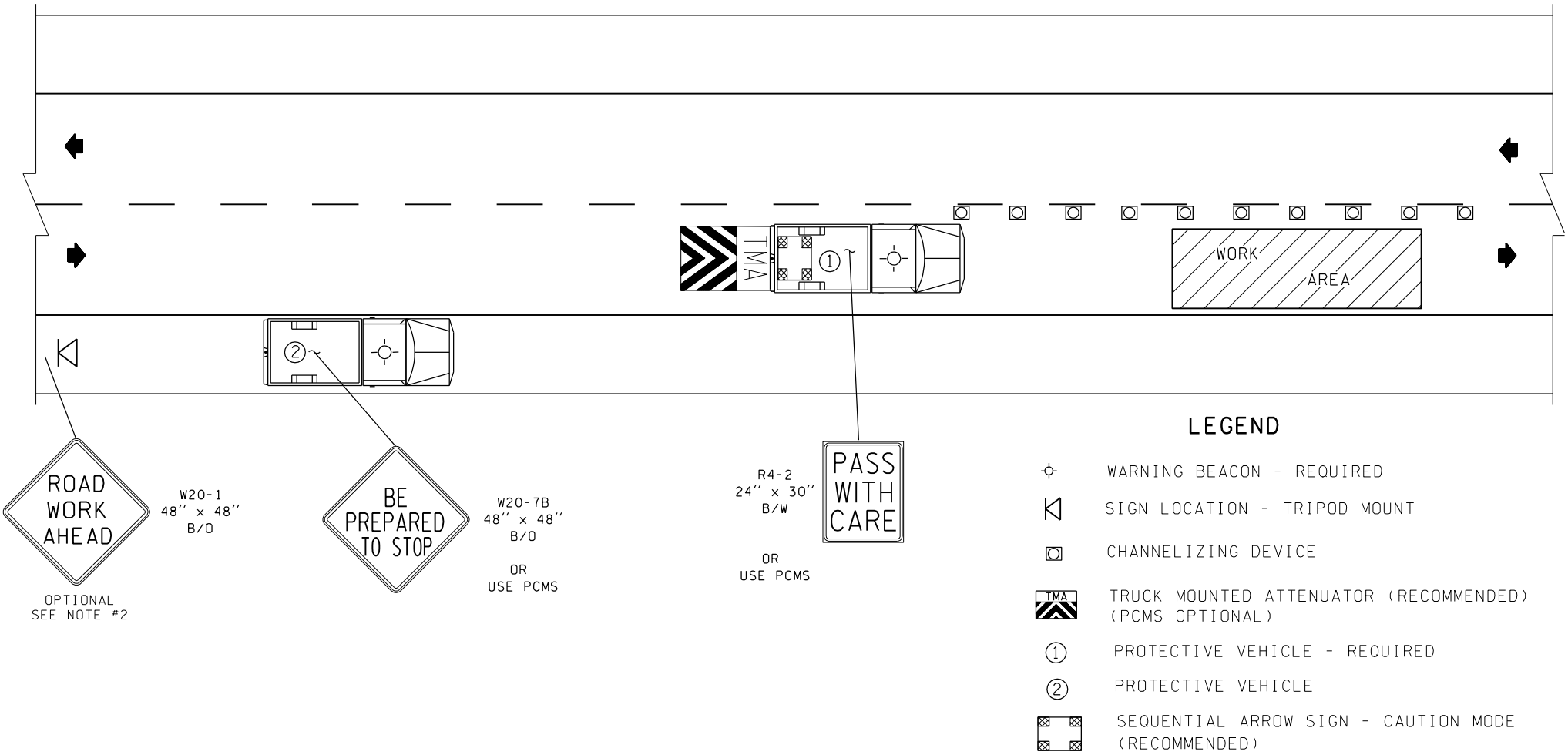
- Use the work vehicle as protection and warning whenever possible.
- Take advantage of any resources that provide protection and warning without causing additional worker exposure. (TMA's, buffer/shadow vehicles, PCMS, etc.)
- Plan ahead. Poor planning is not a valid excuse for lack of equipment, devices or awareness of traffic conditions.
- Whenever possible, find the safest available location to park or unload equipment.
- Avoid high traffic volume hours and locations. Plan ahead for better traffic conditions or consider alternate work operations.
- Work on the same side of the road as the work vehicle and warning beacon whenever possible.

WORK ZONE CONDITION (SEE CONDITION GUIDANCE)

A - ALLOWED, VEHICLE #1 REQUIRED, ALL OTHER DEVICES OPTIONAL.
B - ALLOWED, VEHICLE #1 REQUIRED, CONSIDER USE OF SPOTTER, DEVICES, VEHICLE #2 AND LOW VOLUME WORK HOURS.
C - NOT ALLOWED, CONSIDER MOBILE OR STATIONARY TCP'S.

NOTES:

1. STOPPING TRAFFIC FOR UP TO 20 MINUTES MAY ALSO BE ALLOWED.
   (CONTACT & COORDINATE WITH REGION TRAFFIC OFFICE)
2. RESTRICTED SIGHT DISTANCE REQUIRES ADDITIONAL ADVANCE WARNING DEVICES OR SIGNS, SEE TCP 27 FOR SIGHT DISTANCE CHART.
3. REFER TO PAGE 17 FOR ROLL AHEAD AND BUFFER DATA INFORMATION.



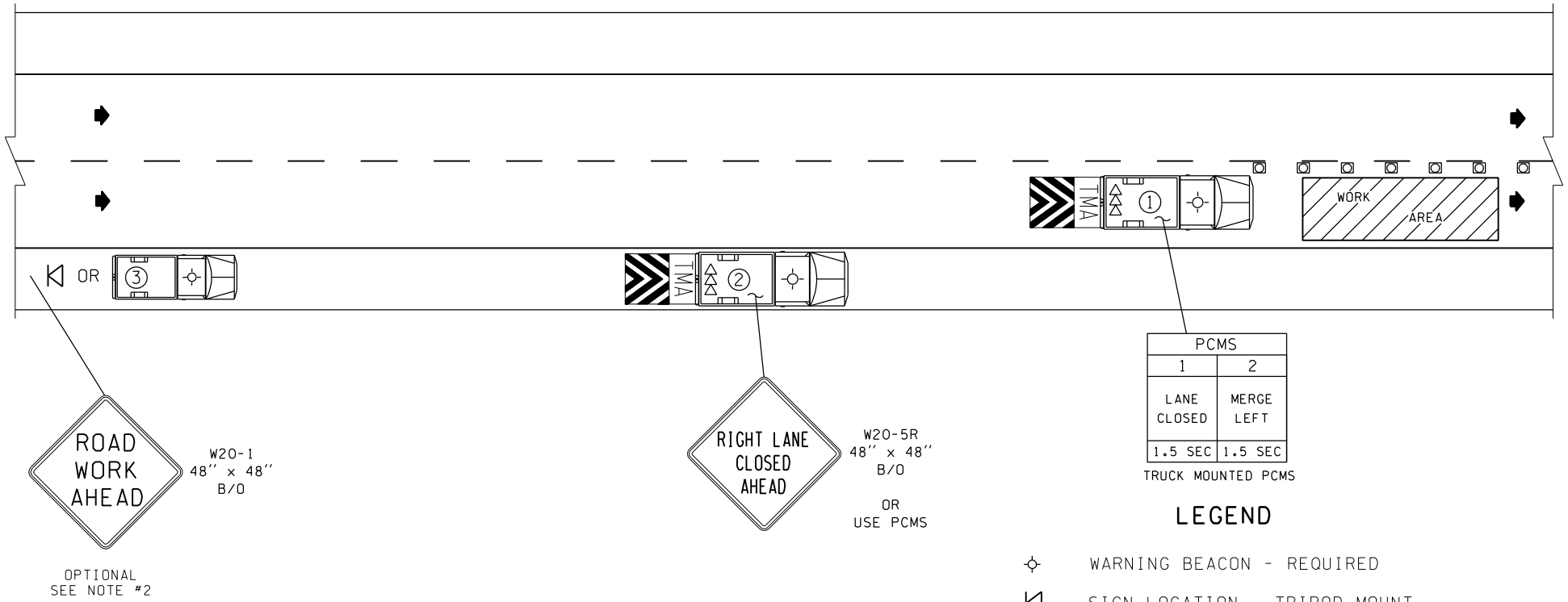
TYPICAL SHORT DURATION LANE CLOSURE
2 LANE OPERATION
TCP 14

WORK ZONE CONDITION (SEE CONDITION GUIDANCE)

A - ALLOWED, VEHICLE #1 REQUIRED, ALL OTHER DEVICES OPTIONAL.
B - ALLOWED, VEHICLE #1 REQUIRED, CONSIDER USE OF SPOTTER, DEVICES.
C - NOT ALLOWED, CONSIDER MOBILE OR STATIONARY TCP'S.

NOTES:

1. VEHICLE #3 MAY BE NEEDED BASED ON TRAFFIC VOLUMES.
2. RESTRICTED SIGHT DISTANCE REQUIRES ADDITIONAL ADVANCE WARNING DEVICES OR SIGNS, SEE TCP 27 FOR SIGHT DISTANCE CHART.
3. REFER TO PAGE 17 FOR ROLL AHEAD AND BUFFER DATA INFORMATION.



PCMS	
1	2
LANE CLOSED	MERGE LEFT
1.5 SEC	1.5 SEC

TRUCK MOUNTED PCMS

LEGEND

- WARNING BEACON - REQUIRED
- SIGN LOCATION - TRIPOD MOUNT
- CHANNELIZING DEVICE
- TMA — TRUCK MOUNTED ATTENUATOR (RECOMMENDED) (PCMS OPTIONAL)
- ① PROTECTIVE VEHICLE - REQUIRED
- ② PROTECTIVE VEHICLE
- ③ PROTECTIVE VEHICLE
- SEQUENTIAL ARROW SIGN - REQUIRED

TYPICAL SHORT DURATION LANE CLOSURE
MULTI-LANE OPERATION
TCP 15

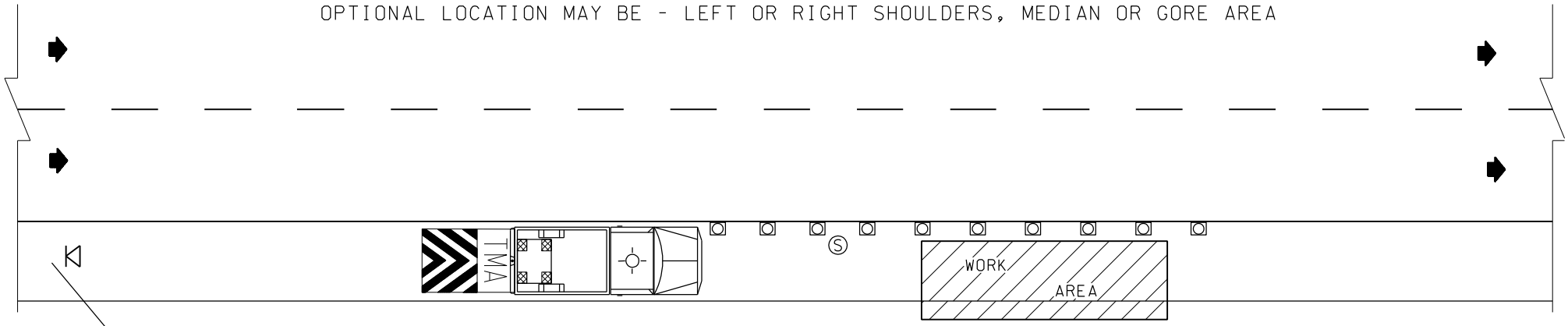
WORK ZONE CONDITION (SEE CONDITION GUIDANCE)

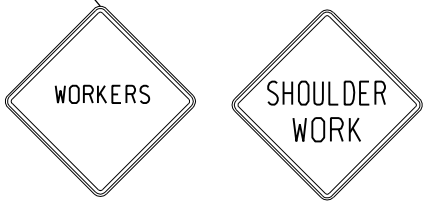
A - ALLOWED - CONSIDER USING A SPOTTER
B - ALLOWED - SPOTTER AND/OR CHANNELIZING DEVICES RECOMMENDED, CONSIDER TMA AND/OR PCMS/ARROW CAUTION MODE.
C - ALLOWED - SPOTTER, CHANNELIZATION DEVICES AND PCMS/ARROW RECOMMENDED, CONSIDER TMA.

NOTES:

1. RESTRICTED SIGHT DISTANCE REQUIRES ADDITIONAL ADVANCE WARNING DEVICES OR SIGNS, SEE TCP 27 FOR SIGHT DISTANCE CHART.
2. NARROW SHOULDERS THAT DO NOT PROVIDE FOR WORK OPERATIONS WITHOUT LANE ENCROACHMENT - 10′ LANE MINIMUM, REQUIRES LANE CLOSURE, SEE TCP 14 OR 15.
3. REFER TO PAGE 17 FOR ROLL AHEAD AND BUFFER DATA INFORMATION.

** ROADWAY EXAMPLE REPRESENTS TYPICAL LOCATION.
OPTIONAL LOCATION MAY BE - LEFT OR RIGHT SHOULDERS, MEDIAN OR GORE AREA





W21-1
48″ × 48″
B/O

OR

W21-5
48″ × 48″
B/O

OR OTHER APPROPRIATE
ADVANCE WARNING SIGN
OR PCMS
(OPTIONAL SEE NOTE 1)

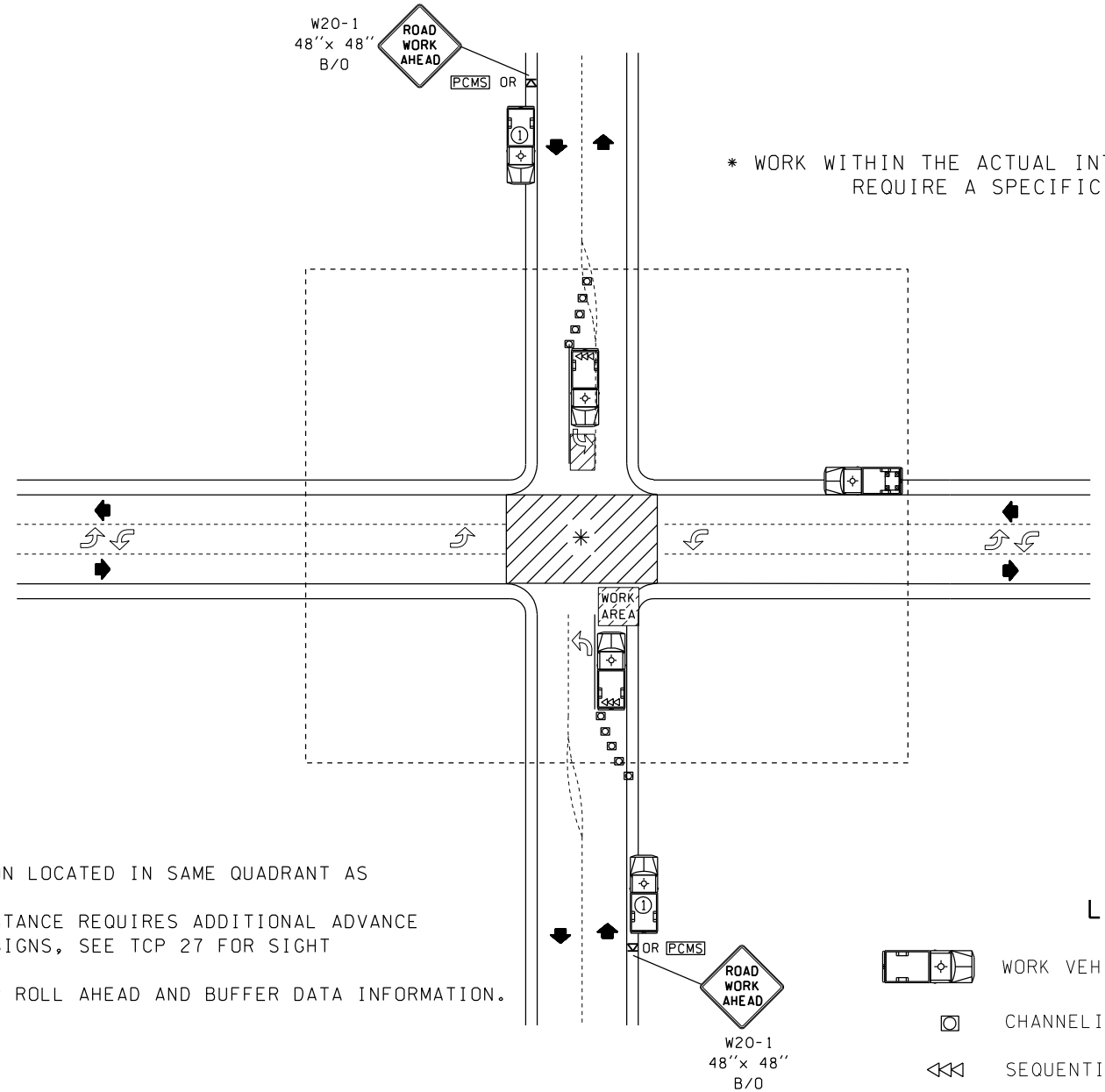
LEGEND

- WORK VEHICLE W/ WARNING BEACON
- SIGN LOCATION - (SEE NOTE 1)
- CHANNELIZING DEVICE
- (S) SPOTTER
- SEQUENTIAL ARROW PANEL - TYPE "B" (CAUTION MODE)
- TMA TRUCK MOUNTED ATTENUATOR (RECOMMENDED)

TYPICAL SHORT DURATION SHOULDER WORK
TCP 16

WORK ZONE CONDITION (SEE CONDITION GUIDANCE)

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



NOTES:

1. WORK VEHICLE W/BEACON LOCATED IN SAME QUADRANT AS WORK LOCATION.
2. RESTRICTED SIGHT DISTANCE REQUIRES ADDITIONAL ADVANCE WARNING DEVICES OR SIGNS, SEE TCP 27 FOR SIGHT DISTANCE CHART.
3. REFER TO PAGE 17 FOR ROLL AHEAD AND BUFFER DATA INFORMATION.

LEGEND

- WORK VEHICLE W/ WARNING BEACON
- CHANNELIZATION DEVICE
- SEQUENTIAL ARROW
- SIGN LOCATION
- ① PROTECTIVE VEHICLE #1 REQUIRED

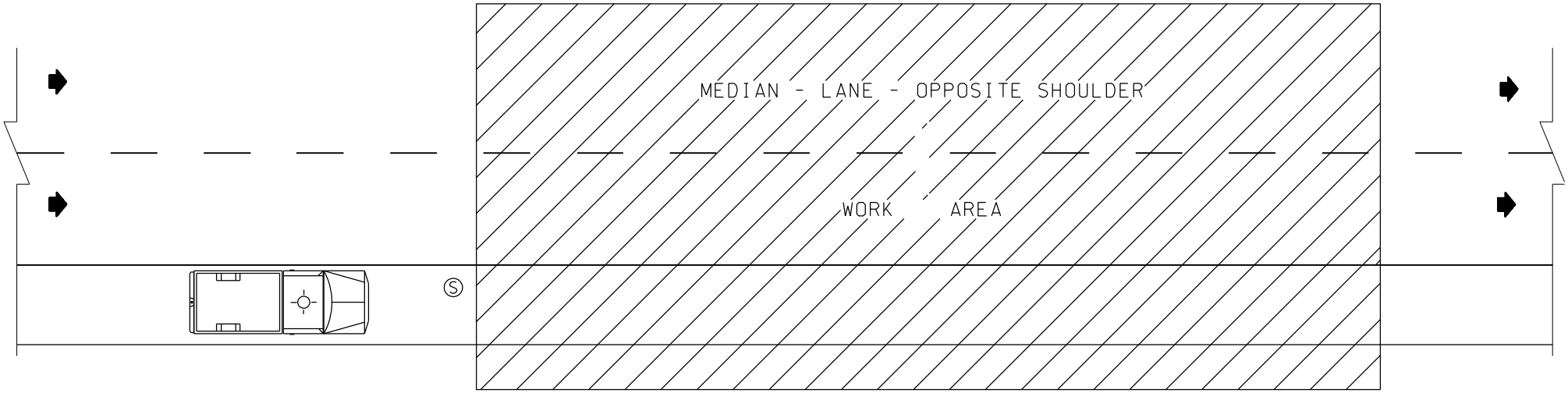
TYPICAL SHORT DURATION WORK OPERATION
INTERSECTION LOCATION
(SEE GUIDANCE TEXT FOR ADDITIONAL DIRECTION)
TCP 17

WORK ZONE CONDITION (SEE CONDITION GUIDANCE)

A - ALLOWED - CONSIDER USING A SPOTTER
B - ALLOWED - SPOTTER RECOMMENDED WORKER ACCESS TO LANE ALLOWED BASED ON SITE ASSESSMENT OF TRAFFIC CONDITIONS.
C - NOT ALLOWED - SEE TCP 3 FOR WORK ZONE REQUIREMENTS.

NOTES:

1. VERY SHORT WORK OPERATIONS MAY BE CONDUCTED AT VARIOUS LOCATIONS OR A WORKER MAY WALK TO THOSE LOCATIONS AS PART OF THE WORK OPERATION.
2. RESTRICTED SIGHT DISTANCE REQUIRES ADDITIONAL ADVANCE WARNING DEVICES OR SIGNS, SEE TCP 27 FOR SIGHT DISTANCE CHART.
3. REFER TO PAGE 17 FOR ROLL AHEAD AND BUFFER DATA INFORMATION.



** ROADWAY EXAMPLE REPRESENTS - LEFT OR RIGHT SHOULDERS, MEDIAN OR GORE AREA

LEGEND

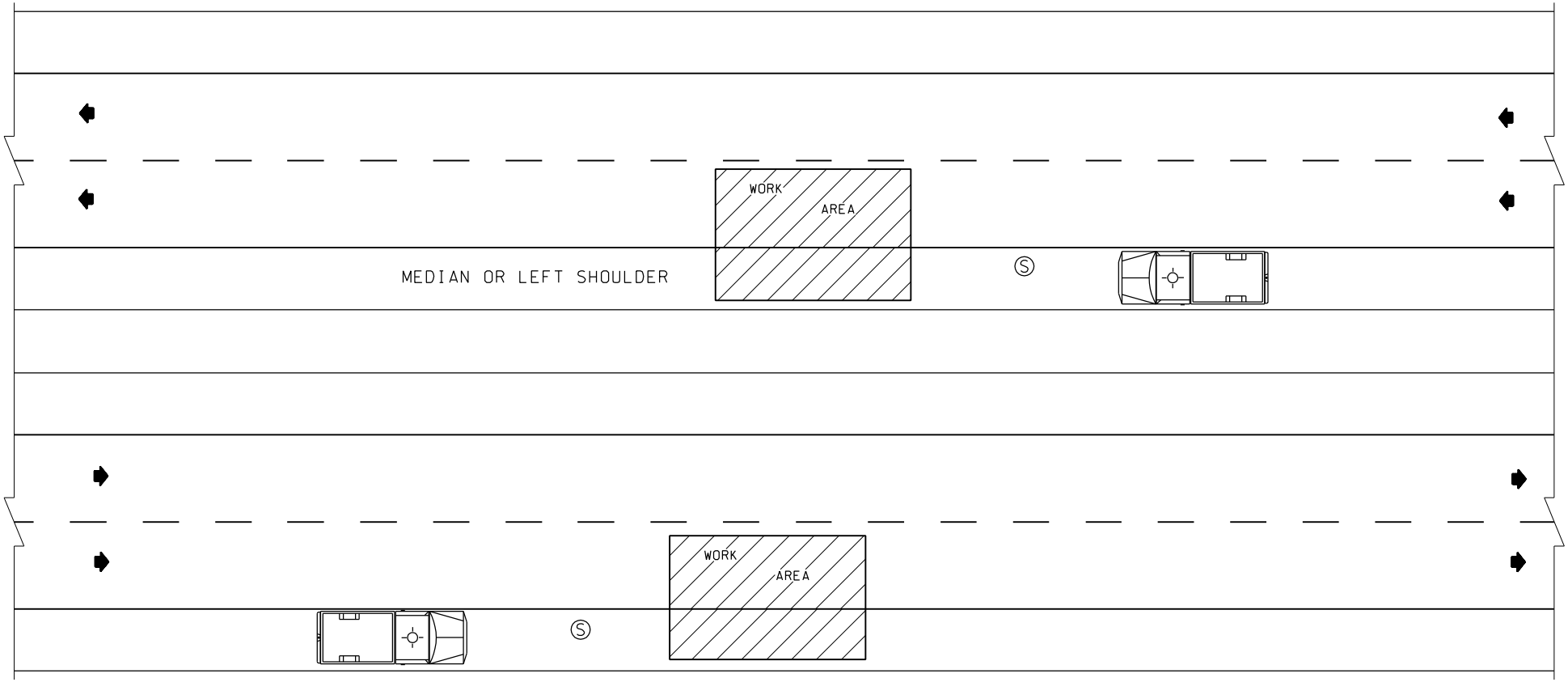
WORK VEHICLE W/ WARNING BEACON

S SPOTTER

TYPICAL VERY SHORT DURATION WORK OPERATION
(SEE GUIDANCE TEXT FOR ADDITIONAL INFORMATION)
TCP 18

WORK ZONE CONDITION (SEE CONDITION GUIDANCE)

A - ALLOWED - CONSIDER USING A SPOTTER
B - ALLOWED - SPOTTER RECOMMENDED WORKER ACCESS TO LANE ALLOWED BASED ON SITE ASSESSMENT OF TRAFFIC CONDITIONS.
C - NOT ALLOWED - SEE TCP 15 FOR WORK ZONE REQUIREMENTS.



NOTES:

1. WORKER(S) MUST MOVE TO SHOULDER ADJACENT TO WORK LANE IF TRAFFIC APPROACHES PRIOR TO COMPLETION OF WORK.
2. REPEATED ACCESS TO WORK LANE NOT ALLOWED. SEE TCP 15 FOR WORK ZONE REQUIREMENTS - CONDITION "C".
3. RESTRICTED SIGHT DISTANCE REQUIRES ADDITIONAL ADVANCE WARNING DEVICES OR SIGNS, SEE TCP 27 FOR SIGHT DISTANCE CHART.
4. REFER TO PAGE 17 FOR ROLL AHEAD AND BUFFER DATA INFORMATION.

LEGEND

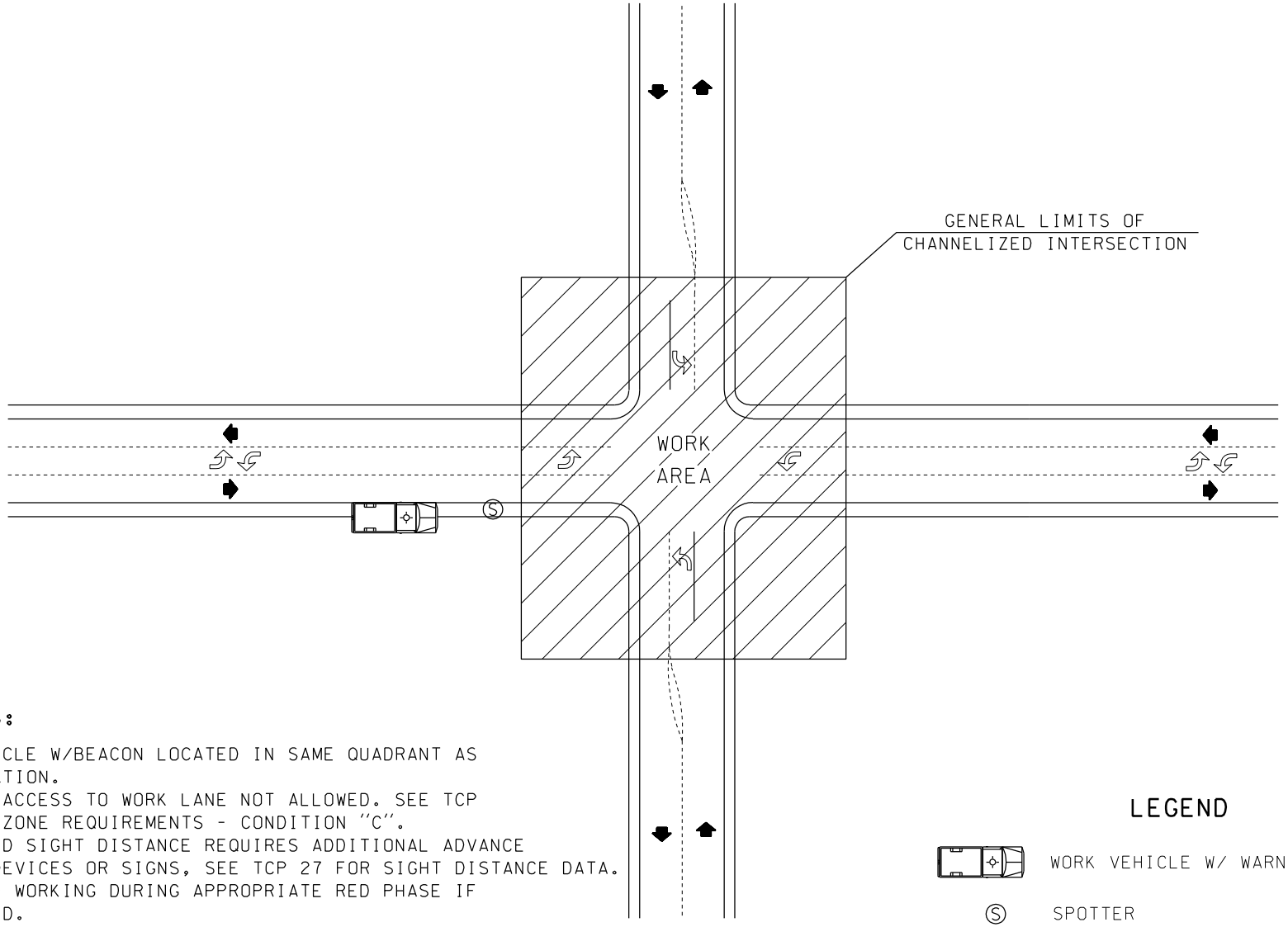
Ⓢ SPOTTER

WORK VEHICLE W/ WARNING BEACON

TYPICAL VERY SHORT DURATION WORK OPERATION
(SEE GUIDANCE TEXT FOR ADDITIONAL DIRECTION)
TCP 19

WORK ZONE CONDITION (SEE CONDITION GUIDANCE)

A - ALLOWED - CONSIDER SPOTTER, WORKER ACCESS TO OR ACROSS LANE(S) ALLOWED BASED ON SITE ASSESSMENT OF TRAFFIC CONDITIONS.
B - ALLOWED - SPOTTER RECOMMENDED CONSIDER ADDITIONAL WARNING.
C - NOT ALLOWED - SEE TCP 28 & 29 FOR WORK ZONE REQUIREMENTS.



NOTES:

1. WORK VEHICLE W/BEACON LOCATED IN SAME QUADRANT AS WORK LOCATION.
2. REPEATED ACCESS TO WORK LANE NOT ALLOWED. SEE TCP FOR WORK ZONE REQUIREMENTS - CONDITION "C".
3. RESTRICTED SIGHT DISTANCE REQUIRES ADDITIONAL ADVANCE WARNING DEVICES OR SIGNS, SEE TCP 27 FOR SIGHT DISTANCE DATA.
4. RECOMMEND WORKING DURING APPROPRIATE RED PHASE IF SIGNALIZED.
5. REFER TO PAGE 17 FOR ROLL AHEAD AND BUFFER DATA INFORMATION.

LEGEND

WORK VEHICLE W/ WARNING BEACON

S SPOTTER

TYPICAL VERY SHORT DURATION WORK OPERATION
INTERSECTION LOCATION
(SEE GUIDANCE TEXT FOR ADDITIONAL DIRECTION)
TCP 20

ROLLING SLOWDOWN

Traffic Control Plan (TCP) 21

A rolling slowdown is a legitimate form of traffic control commonly practiced by the WSP, contractors and highway maintenance crews. This use is valuable for emergency, or ***very* specific** short duration closures (e.g. to set bridge girders, 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, which reduces traffic speeds and creates 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 should be considered first and be 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 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. TCP 21 on page 54 has been developed as a guideline to represent the basic requirements for performing a safe and effective rolling slowdown. Site specific TCP's can be developed based on this plan.

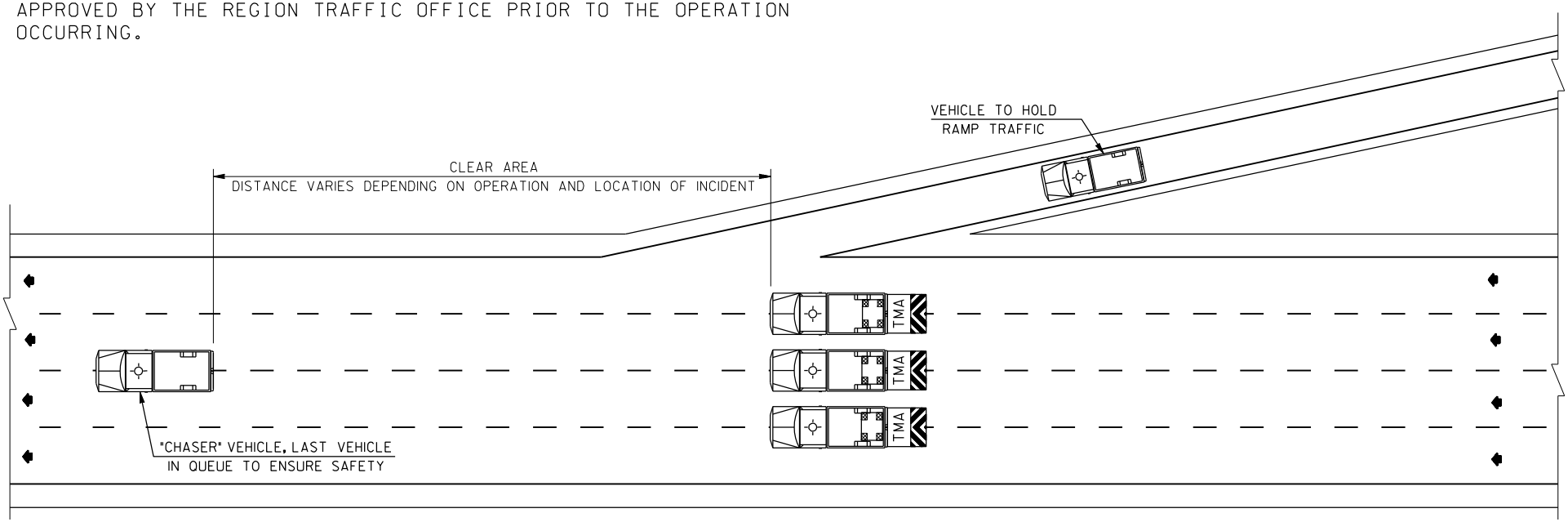
Equipment availability is a prime consideration. Before starting this operation, ensure there are at least one traffic control vehicle (with flashing amber lights) per lane to be slowed, ***and*** one vehicle to cover every point of access onto the 'rolling slowdown' segment of roadway. (Only during emergencies should less than one traffic control vehicle per lane be considered.) Truck mounted PCMS boards stating, "Slow or Stopped Vehicles" or "Rolling Slowdown In Progress" 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.

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	
1	2
SLOW OR STOPPED VEHICLES	DO NOT PASS
1.5 SEC	1.5 SEC

LEGEND

TMA — TRUCK MOUNTED ATTENUATOR (RECOMMENDED)

WARNING BEACON

SEQUENTIAL ARROW - CAUTION MODE (REQUIRED)

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. WSP SHALL BE NOTIFIED AND ON SITE WHEN AVAILABLE.
4. ALL ON-RAMP TRAFFIC SHALL BE STOPPED DURING SLOWDOWN.

TYPICAL ROLLING SLOWDOWN
TCP 21

MOBILE WORK ZONES

Traffic Control Plans (TCP's) 22 to 27

Mobile work zones are work activities that typically move along the road either intermittently or continuously. Frequent short stops may be used for pothole patching, litter cleanup, herbicide spraying, lane marker replacement or other similar operations. Channelizing devices, truck mounted signs or Portable Changeable Message Signs (PCMS), warning lights and flaggers may be needed for these operations.

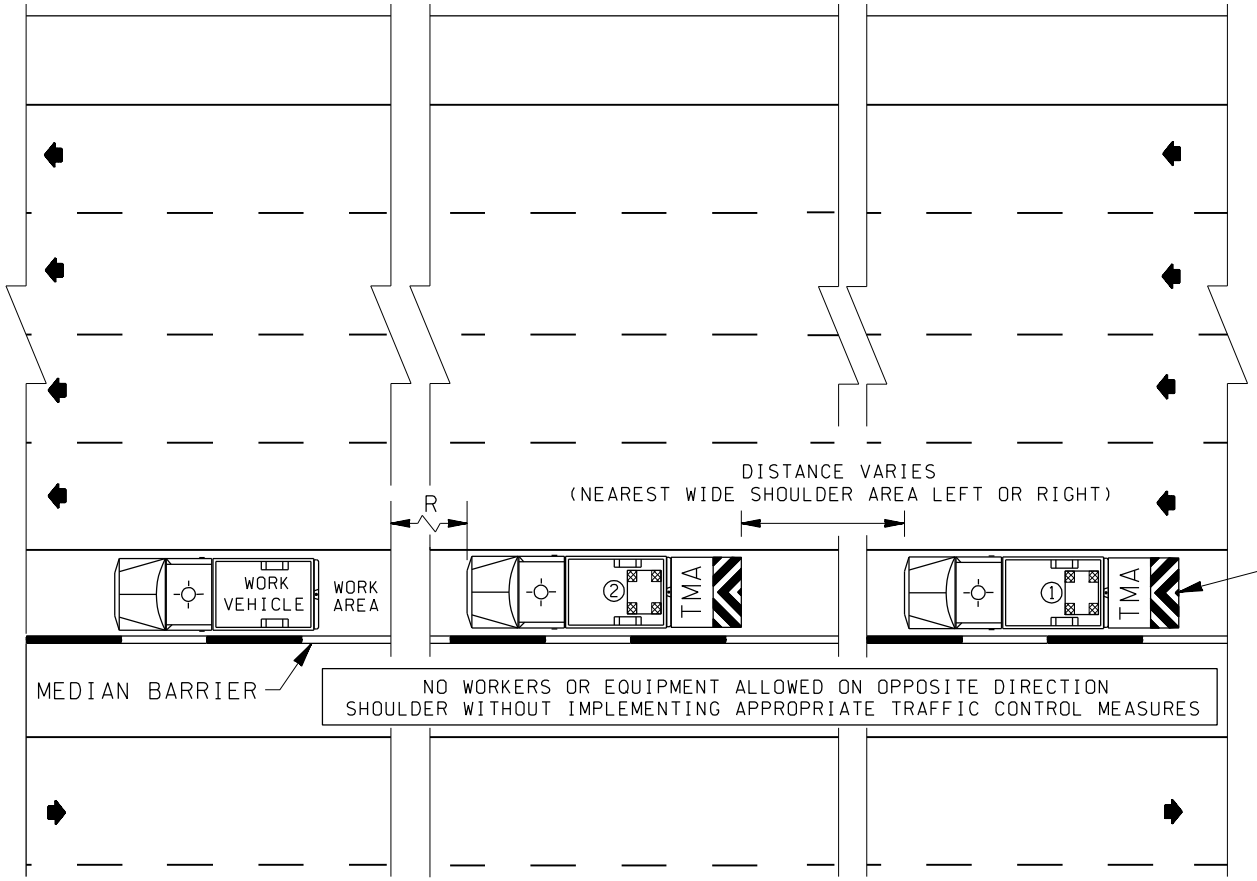
Mobile work zones also include slow moving operations where workers and equipment move along the road without stopping. Operations such as sweeping and paint striping are typical mobile operations. The warning signs move ahead with the work, usually mounted on a shadow vehicle. Truck mounted signs or PCMS, Truck Mounted Attenuator (TMA) and warning lights are some of the devices that may be used for moving operations. Messages for truck mounted PCMS's should conform to standard work messages whenever possible. Contact the Region Traffic Office Staff for assistance with selecting appropriate messages.

Mobile work zones are well suited to maintenance operations and can be an efficient way to accomplish many types of work, but due to the moving nature of these operations it is imperative that the crew is carefully coordinated. Careful consideration of traffic and roadway conditions as they relate to the specific operation must be done prior to starting work.

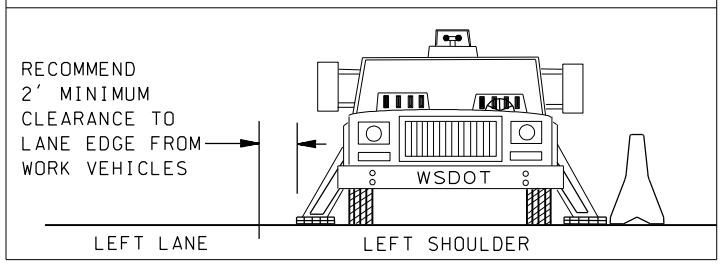
The following TCP's show typical examples of mobile work zones.

Many work operations that may have been previously conducted as short-term operations can be significantly improved by converting to a mobile operation. Contact the region traffic office for assistance.

TYPICAL FREEWAY APPLICATION
(ACTUAL NUMBER OF LANES MAY VARY)



LATERAL CLEARANCE DETAIL



W21-5
48'' x 48''
B/O

(SAMPLE MESSAGE)

PCMS	
1	2
LEFT SHOULDER CLOSED	SLOW MOVING VEHICLES
1.5 SEC	1.5 SEC

Field locate in advance of lane closure. (TRUCK MOUNTED OR TRAILER MOUNTED OPTIONAL)

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R
ROLL AHEAD DISTANCES VARY AND SHALL BE DETERMINED IN FIELD BASED ON WORK OPERATION AND SITE SPECIFIC CONDITIONS.
USE OF A TRUCK MOUNTED ATTENUATOR RECOMMENDED

OPERATIONAL NOTES

1. SHADOW VEHICLE #1, MOUNT SHOULDER CLOSURE SIGN ON BACK OF VEHICLE. DO NOT OBSCURE SEQUENTIAL ARROW PANEL. MAINTAIN 1000' TO 1500' OF SIGHT DISTANCE TO APPROACHING TRAFFIC (TMA RECOMMENDED).
2. PROTECTIVE VEHICLE #2, POSITION VEHICLE TO PROVIDE PROTECTION OF CREW. MAINTAIN ROLL-AHEAD DISTANCE (TMA RECOMMENDED).
3. 2' MINIMUM CLEARANCE RECOMMENDED BETWEEN LANE EDGE AND WORK VEHICLE. ADJACENT LANE MUST BE CLOSED IF ADDITIONAL CLEARANCE IS REQUIRED OR IF WORK ACTIVITIES ADVERSELY INFLUENCE TRAFFIC.
4. CONTACT REGION TRAFFIC MANAGEMENT CENTER PRIOR TO WORK BEGIN AND END.
5. PCMS RECOMMENDED.

LEGEND

SEQUENTIAL ARROW PANEL - TYPE "B" (CAUTION MODE)

TMA — TRUCK MOUNTED ATTENUATOR

WARNING BEACON - REQUIRED

MOBILE FREEWAY OPERATION
LEFT SHOULDER CLOSED
TCP 22

(SAMPLE MESSAGE)

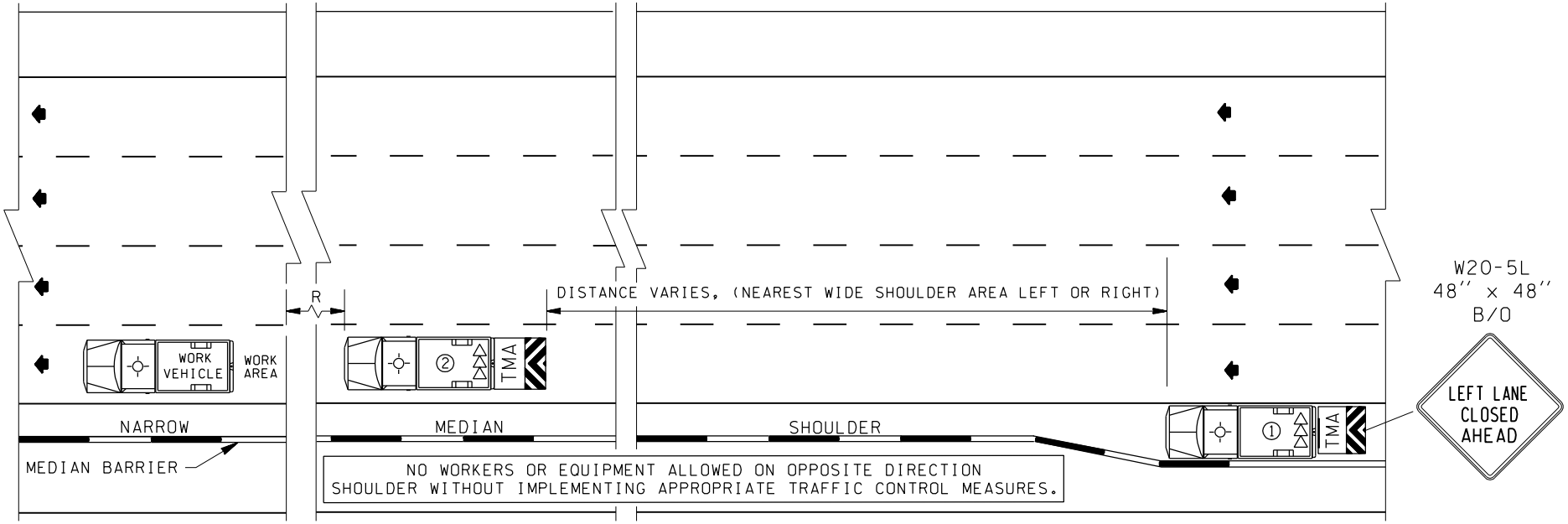
PCMS	
1	2
LEFT LANE CLOSED	MERGE RIGHT
1.5 SEC	1.5 SEC

Field locate in advance of lane closure. (TRUCK MOUNTED OR TRAILER MOUNTED OPTIONAL)

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R
ROLL AHEAD DISTANCES VARY AND SHALL BE DETERMINED IN FIELD BASED ON WORK OPERATION AND SITE SPECIFIC CONDITIONS.
USE OF A TRUCK MOUNTED ATTENUATOR RECOMMENDED

TYPICAL FREEWAY APPLICATION

(ACTUAL NUMBER OF LANES MAY VARY)



OPERATIONAL NOTES

1. SHADOW VEHICLE #1, MOUNT LANE CLOSURE SIGN ON BACK OF VEHICLE. DO NOT OBSCURE SEQUENTIAL ARROW PANEL. MAINTAIN 1000′ TO 1500′ OF SIGHT DISTANCE TO APPROACHING TRAFFIC (TMA RECOMMENDED).
2. PROTECTIVE VEHICLE #2, POSITION VEHICLE TO PROVIDE PROTECTION OF CREW. MAINTAIN ROLL AHEAD DISTANCE (TMA RECOMMENDED).
3. 2′ MINIMUM CLEARANCE RECOMMENDED BETWEEN LANE EDGE AND WORK VEHICLE. ADJACENT LANE MUST BE CLOSED IF ADDITIONAL CLEARANCE IS REQUIRED OR IF WORK ACTIVITIES ADVERSELY INFLUENCE TRAFFIC.
4. CONTACT REGION TRAFFIC MANAGEMENT CENTER PRIOR TO WORK BEGINS AND AFTER ENDING.
5. PCMS RECOMMENDED.

LEGEND

▷▷▷ SEQUENTIAL ARROW PANEL - TYPE ''B'' MIN.

TMA TRUCK MOUNTED ATTENUATOR

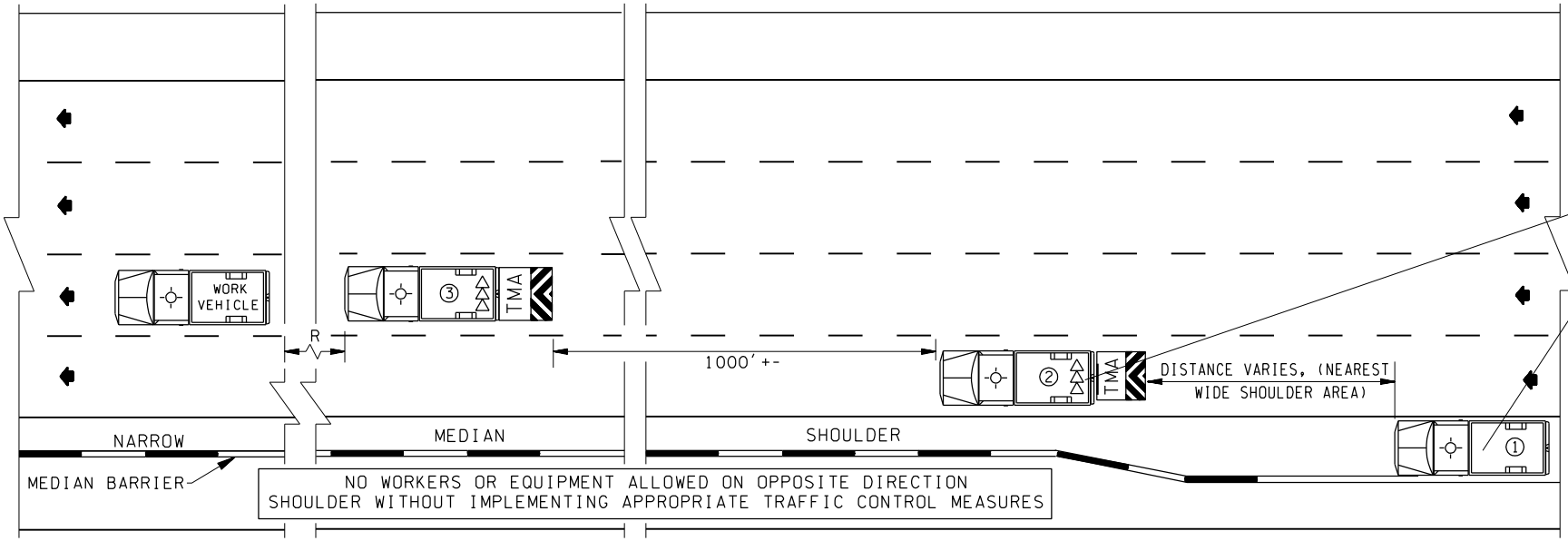
WARNING BEACON - REQUIRED

MOBILE FREEWAY OPERATION
LEFT LANE CLOSURE
TCP 23

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R
ROLL AHEAD DISTANCES VARY AND SHALL BE DETERMINED IN FIELD BASED ON WORK OPERATION AND SITE SPECIFIC CONDITIONS.
USE OF A TRUCK MOUNTED ATTENUATOR RECOMMENDED

TYPICAL FREEWAY APPLICATION

(ACTUAL NUMBER OF LANES MAY VARY)



W20-5
48'' x 48''
B/O

OR

(SAMPLE MESSAGES)

PCMS	
1	2
LEFT 2 LANES CLOSED	SLOW MOVING VEHICLES
1.5 SEC	1.5 SEC

OPERATIONAL NOTES

1. ADVANCE WARNING VEHICLE #1, MOUNT LANE CLOSURE SIGN ON BACK OF VEHICLE. MAINTAIN 1000' TO 1500' SIGHT DISTANCE TO APPROACHING VEHICHLES. (TMA RECOMMENDED)
2. SHADOW VEHICLE #2, MOUNT LANE CLOSURE SIGN ON BACK OF VEHICLE. DO NOT OBSCURE SEQUENTIAL ARROW PANEL. MAINTAIN 1000' TO 1500' OF SIGHT DISTANCE TO APPROACHING TRAFFIC (TMA RECOMMENDED).
3. PROTECTIVE VEHICLE #3, POSITION VEHICLE TO PROVIDE PROTECTION OF CREW. MAINTAIN ROLL AHEAD DISTANCE (TMA RECOMMENDED).
4. 2' MINIMUM CLEARANCE RECOMMENDED BETWEEN LANE EDGE AND WORK VEHICLE. ADJACENT LANE MUST BE CLOSED IF ADDITIONAL CLEARANCE IS REQUIRED OR IF WORK ACTIVITIES ADVERSELY INFLUENCE TRAFFIC.
5. CONTACT REGION TRAFFIC MANAGEMENT CENTER PRIOR TO WORK BEGIN AND END.
6. PCMS RECOMMENDED.

LEGEND

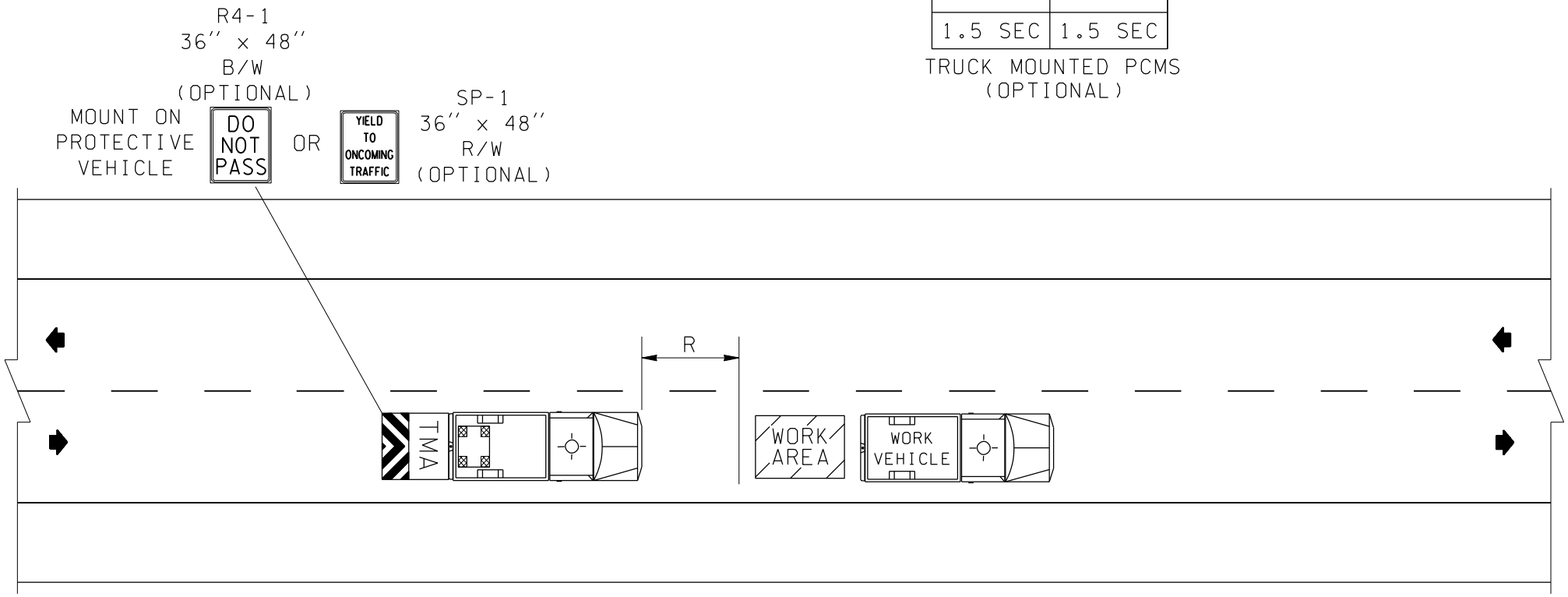
- SEQUENTIAL ARROW PANEL - TYPE "B" MIN.
- TMA — TRUCK MOUNTED ATTENUATOR (RECOMMENDED)
- WARNING BEACON - REQUIRED

MOBILE FREEWAY OPERATION
MIDDLE LANE WORK AREA
TCP 24

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R
ROLL AHEAD DISTANCES VARY AND SHALL BE DETERMINED IN FIELD BASED ON WORK OPERATION AND SITE SPECIFIC CONDITIONS.
USE OF A TRUCK MOUNTED ATTENUATOR RECOMMENDED

PCMS	
1	2
SLOW MOVING VEHICLE	YIELD TO ONCOMING TRAFFIC
1.5 SEC	1.5 SEC

TRUCK MOUNTED PCMS
(OPTIONAL)



OPERATIONAL NOTES

1. WORK VEHICLE AND PROTECTIVE VEHICLE SHALL USE WARNING BEACONS.
2. PROTECTIVE VEHICLE SHALL MAINTAIN 500'-1000' 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. PCMS RECOMMENDED.

LEGEND

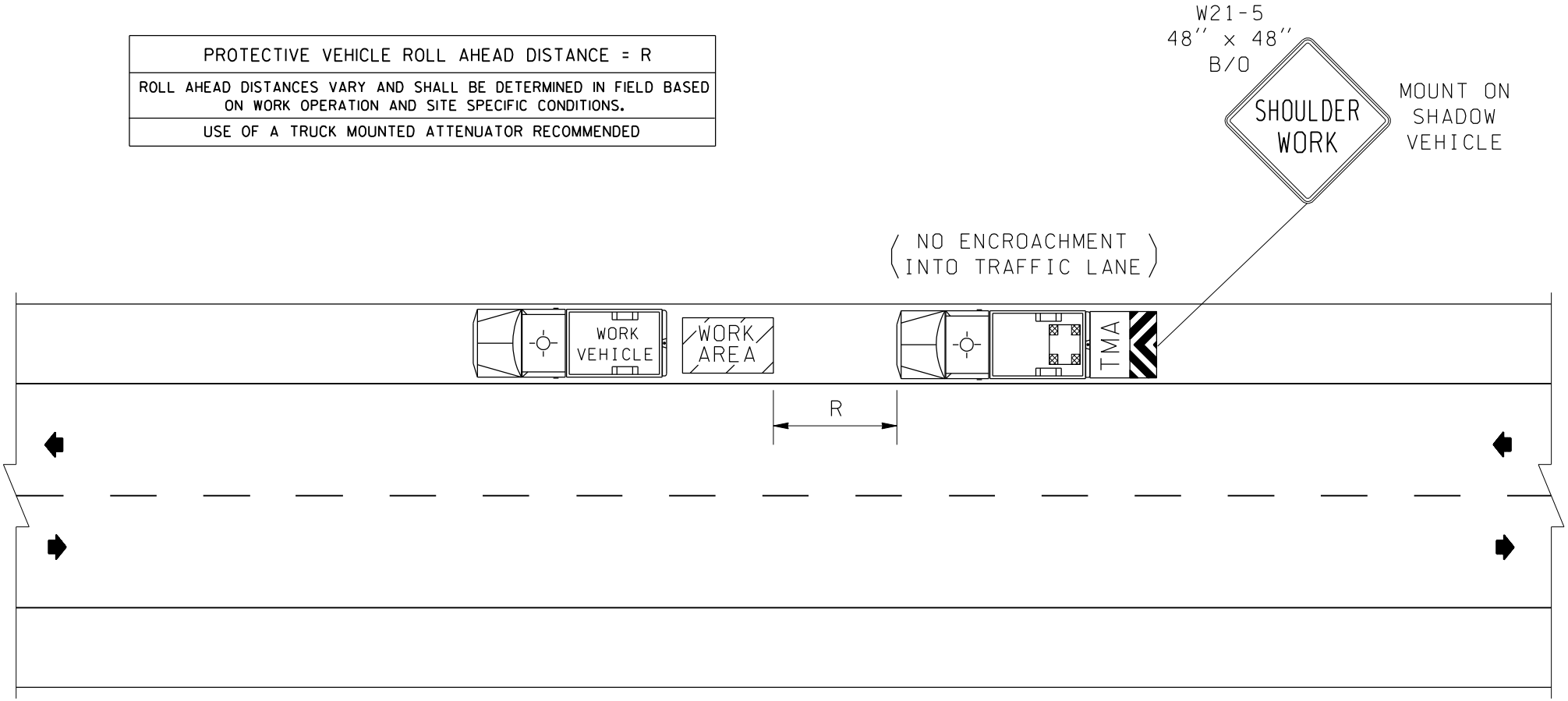
SEQUENTIAL ARROW PANEL - TYPE "B" (CAUTION MODE)

TMA — TRUCK MOUNTED ATTENUATOR (RECOMMENDED)

WARNING BEACON

TYPICAL MOBILE OPERATION
TWO LANE ROADWAY
LANE CLOSURE
TCP 25

PROTECTIVE VEHICLE ROLL AHEAD DISTANCE = R
ROLL AHEAD DISTANCES VARY AND SHALL BE DETERMINED IN FIELD BASED ON WORK OPERATION AND SITE SPECIFIC CONDITIONS.
USE OF A TRUCK MOUNTED ATTENUATOR RECOMMENDED



OPERATIONAL NOTES

1. WORK VEHICLE AND PROTECTIVE VEHICLE SHALL USE WARNING BEACONS.
2. PROTECTIVE VEHICLE SHALL MAINTAIN 500'-1000' 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.

LEGEND

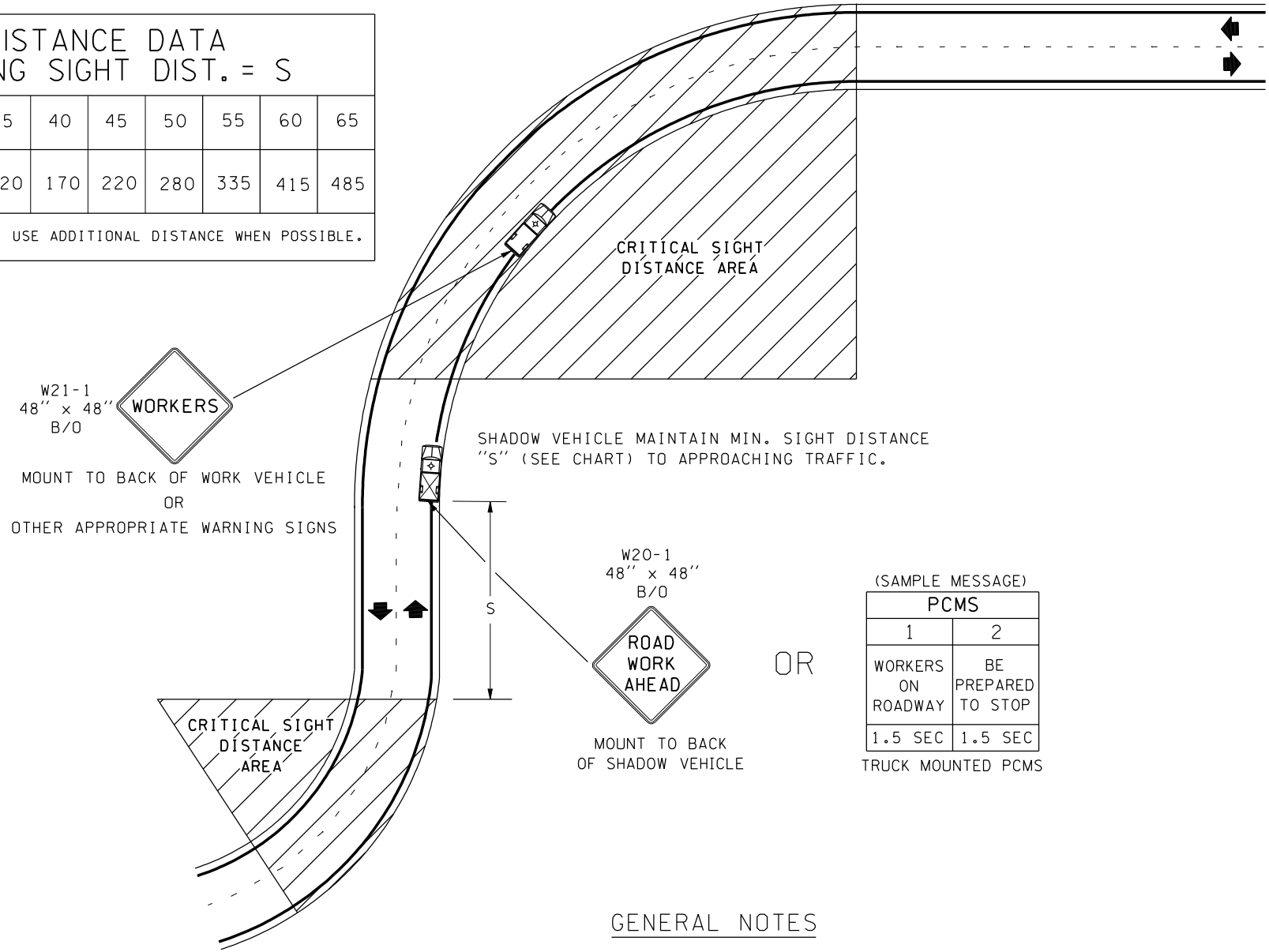
SEQUENTIAL ARROW PANEL - TYPE "B" (CAUTION MODE)

TMA — TRUCK MOUNTED ATTENUATOR (RECOMMENDED)

WARNING BEACON

TYPICAL MOBILE OPERATION
TWO LANE ROADWAY
SHOULDER CLOSURE
TCP 26

SIGHT DISTANCE DATA MIN. STOPPING SIGHT DIST. = S									
SPEED LIMIT MPH	25	30	35	40	45	50	55	60	65
DISTANCE FEET	55	85	120	170	220	280	335	415	485
DISTANCES SHOWN ARE MINIMUMS, USE ADDITIONAL DISTANCE WHEN POSSIBLE.									



LEGEND

WORK VEHICLE WITH FLASHING AMBER WARNING BEACON

SHADOW VEHICLE WITH FLASHING AMBER WARNING BEACON (TMA RECOMMENDED, BUT NOT REQUIRED)

GENERAL NOTES

1. DAYLIGHT HOURS ONLY.
2. RADIO CONTACT BETWEEN WORK CREW AND SHADOW VEHICLE REQUIRED.
3. PCMS RECOMMENDED.

MOBILE SHOULDER OPERATION WITH LANE ENCROACHMENT
TCP 27

INTERSECTION OPERATIONS

Traffic Control Plans (TCP's) 28 to 30

Traffic control at intersections requires specific attention because traffic is usually in-bound from all directions. The traffic on all approaches needs to be given the same advance warning with the messages on the warning signs to be appropriate for the situation ahead of them. When an intersection is to be controlled by flaggers, always be sure that an existing signal does not give the drivers a conflicting message. For example, don't stop traffic when the signal is green. It is always best to turn off the signal during flagging operations.

The traffic control plans in this section show a pair of rather complex intersections. In general, use these examples as guidelines and prepare specific traffic control plans for the intersections you will be working in, showing the lanes and turning movements as they appear on the roadway.

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	-	-

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT		

• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

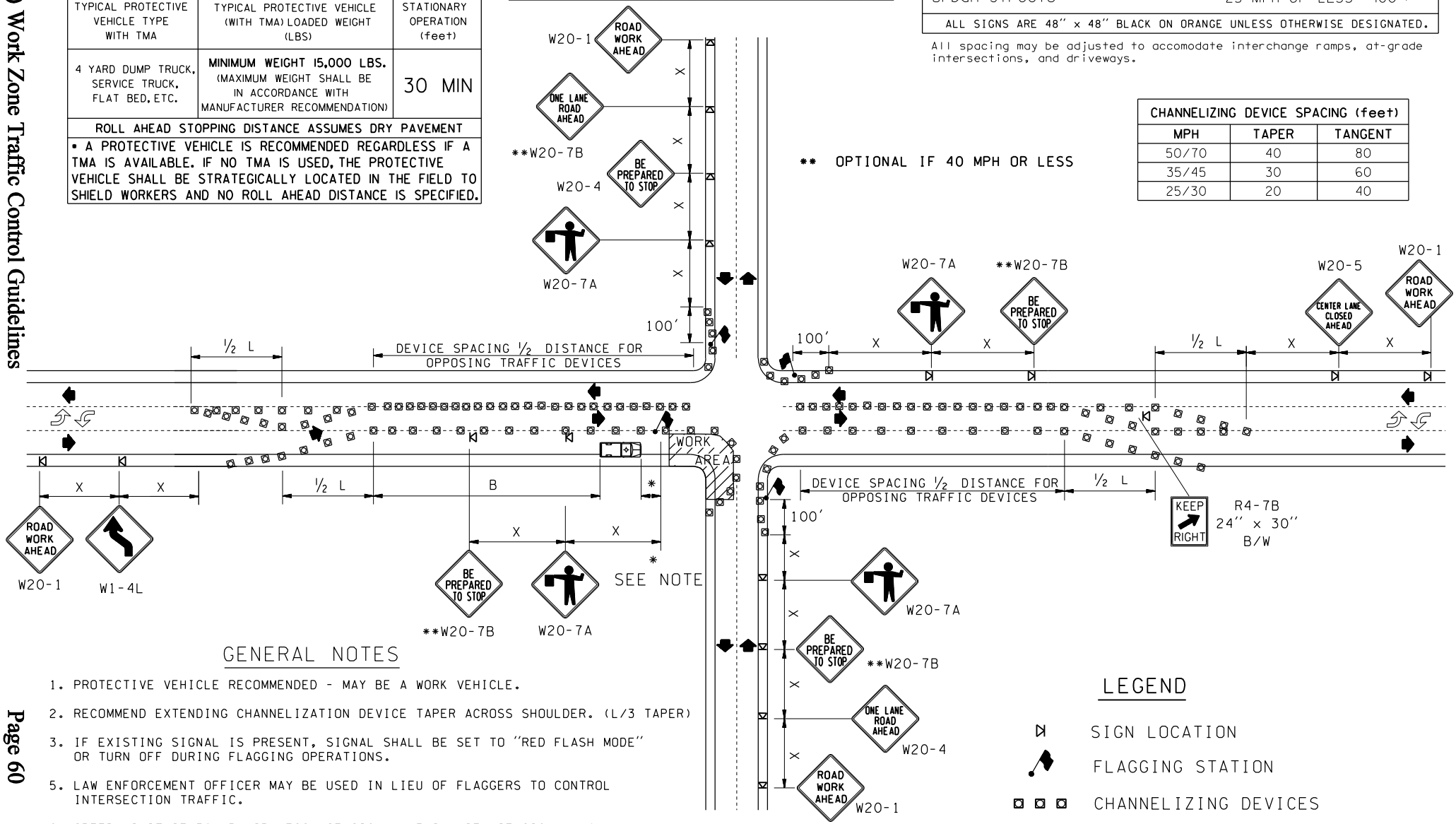
MINIMUM TAPER LENGTH = L (feet)										
LANE WIDTH (feet)	Posted Speed (mph)									
	25	30	35	40	45	50	55	60	65	70
10	105	150	205	270	450	500	550	-	-	-
11	115	165	225	295	495	550	605	660	-	-
12	125	180	245	320	540	600	660	720	-	-

SIGN SPACING = X (feet)		
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
Urban Streets	25 MPH or LESS	100'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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

CHANNELIZING DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

** OPTIONAL IF 40 MPH OR LESS



GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
2. RECOMMEND EXTENDING CHANNELIZATION DEVICE TAPER ACROSS SHOULDER. (L/3 TAPER)
3. IF EXISTING SIGNAL IS PRESENT, SIGNAL SHALL BE SET TO "RED FLASH MODE" OR TURN OFF DURING FLAGGING OPERATIONS.
5. LAW ENFORCEMENT OFFICER MAY BE USED IN LIEU OF FLAGGERS TO CONTROL INTERSECTION TRAFFIC.
6. SPEED LIMIT OF 30 MPH OR LESS USE SIGN W1-3 IN LIEU OF SIGN W1-4.
7. MAINTAIN A MINIMUM OF ONE ACCESS POINT FOR EACH BUSINESS WITHIN WORK AREA LIMITS.

LEGEND

- SIGN LOCATION
- FLAGGING STATION
- CHANNELIZING DEVICES
- PROTECTIVE VEHICLE - RECOMMENDED
- WARNING BEACON - REQUIRED

INTERSECTION LANE CLOSURE
TCP 28

BUFFER DATA										
LONGITUDINAL BUFFER SPACE = B										
SPEED (MPH)	25	30	35	40	45	50	55	60	65	70
LENGTH (feet)	55	85	120	170	220	280	335	415	-	-

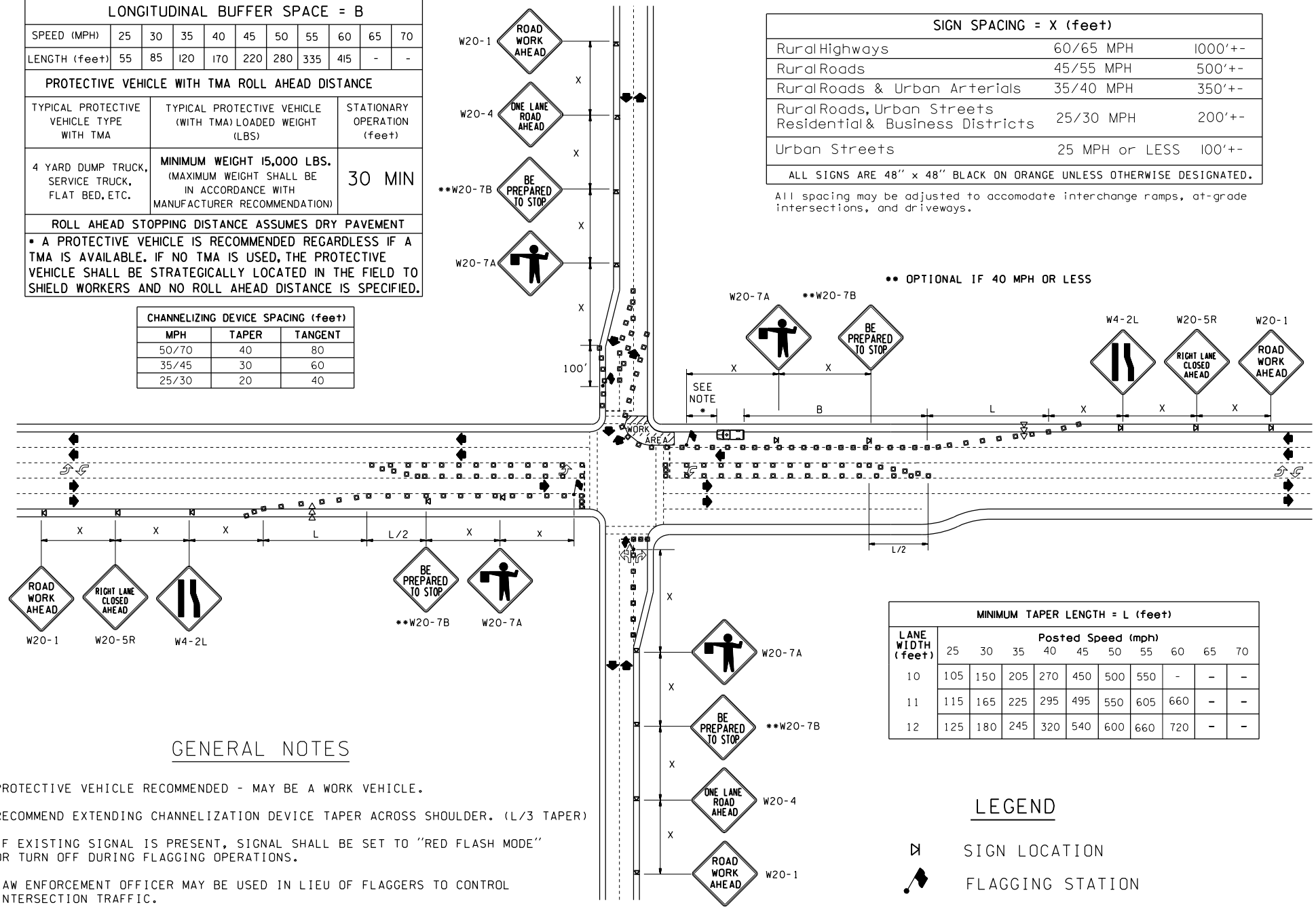
PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT		

• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

CHANNELIZING DEVICE SPACING (feet)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

SIGN SPACING = X (feet)		
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
Urban Streets	25 MPH or LESS	100'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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



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	-	-

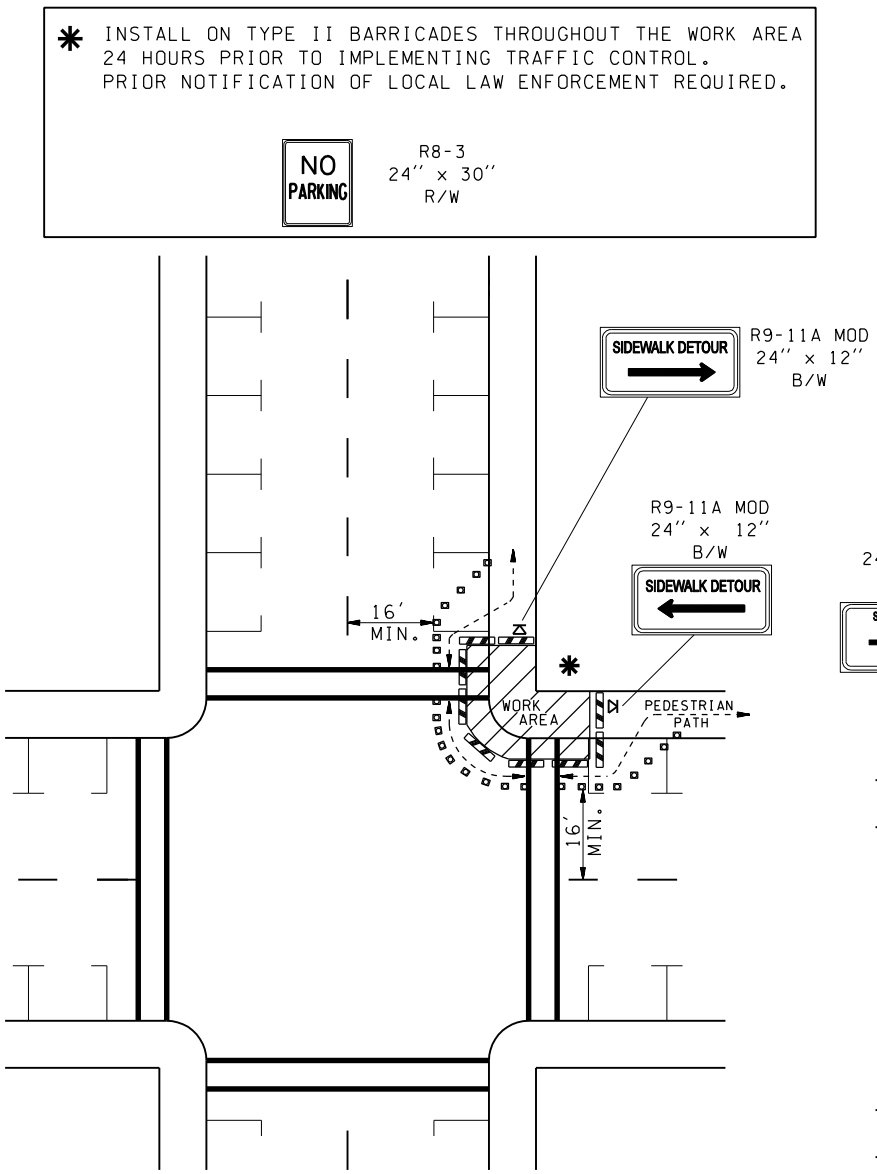
GENERAL NOTES

1. PROTECTIVE VEHICLE RECOMMENDED - MAY BE A WORK VEHICLE.
2. RECOMMEND EXTENDING CHANNELIZATION DEVICE TAPER ACROSS SHOULDER. (L/3 TAPER)
3. IF EXISTING SIGNAL IS PRESENT, SIGNAL SHALL BE SET TO "RED FLASH MODE" OR TURN OFF DURING FLAGGING OPERATIONS.
5. LAW ENFORCEMENT OFFICER MAY BE USED IN LIEU OF FLAGGERS TO CONTROL INTERSECTION TRAFFIC.
6. SPEED LIMIT OF 30 MPH OR LESS USE SIGN W1-3 IN LIEU OF SIGN W1-4.
7. MAINTAIN A MINIMUM OF ONE ACCESS POINT FOR EACH BUSINESS WITHIN WORK AREA LIMITS.

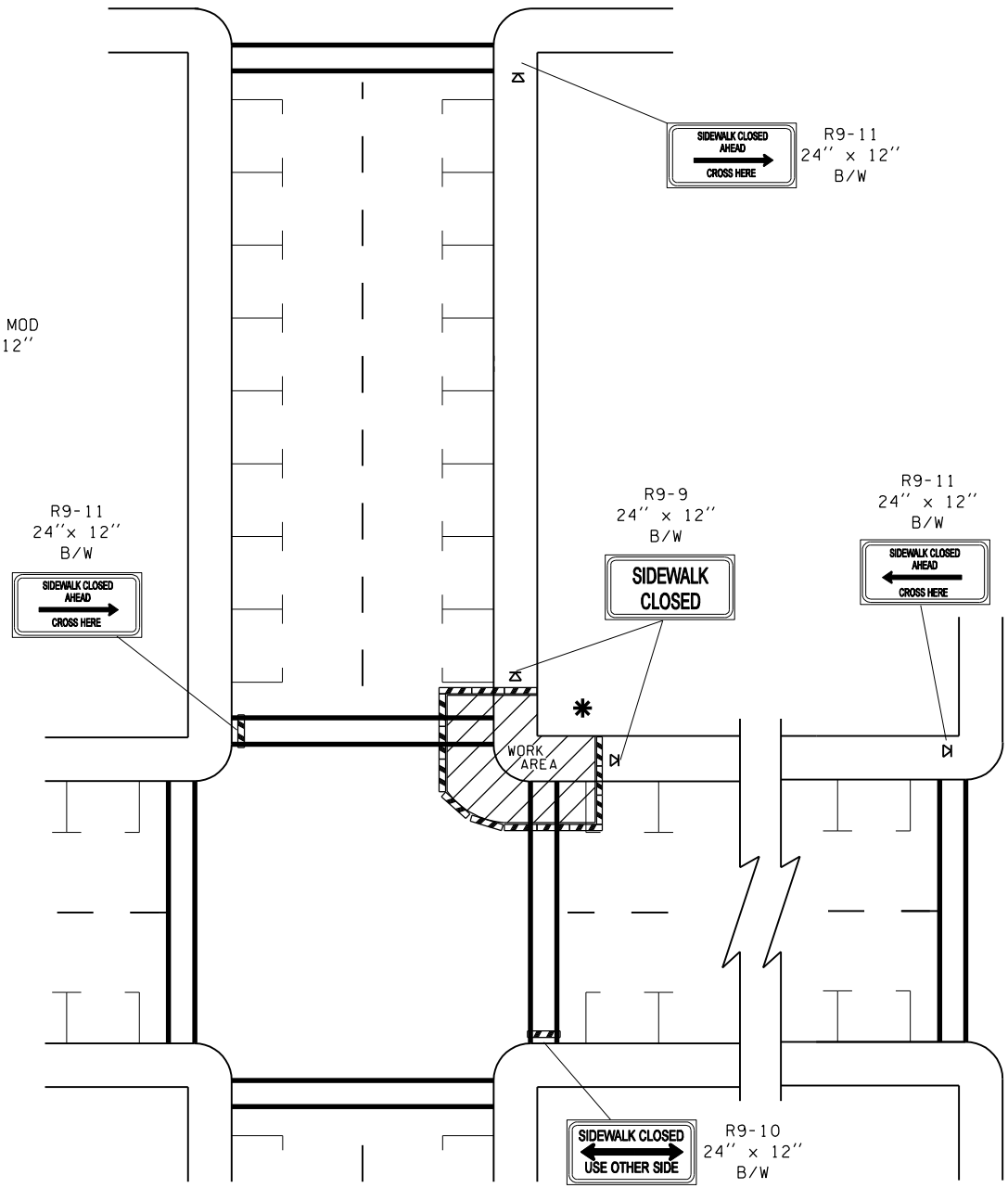
LEGEND

- SIGN LOCATION
- FLAGGING STATION
- CHANNELIZING DEVICES
- SEQUENTIAL ARROW SIGN
- PROTECTIVE VEHICLE - RECOMMENDED
- WARNING BEACON - REQUIRED

INTERSECTION LANE CLOSURE
TCP 29



PEDESTRIAN DETOUR
(NONWORKING HOURS)



PEDESTRIAN DETOUR
(WORKING HOURS)

LEGEND

- SIGN LOCATION
- CHANNELIZING DEVICES
- TYPE II BARRICADE

INTERSECTION PEDESTRIAN TRAFFIC CONTROL
TCP 30

GENERAL NOTES

1. CONTROLS SHOWN ARE FOR PEDESTRIAN TRAFFIC ONLY.
2. USE WARNING LIGHTS ON BARRICADES.
3. MAINTAIN A MINIMUM WIDTH OF 36'' FOR PEDESTRIAN PATH.
4. CONTACT AND COORDINATE IMPACTED TRANSIT AGENCIES PRIOR TO IMPLEMENTING ANY CLOSURES.

EMERGENCY OPERATIONS

Traffic Control Plan (TCP) 31

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 are an option.

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.

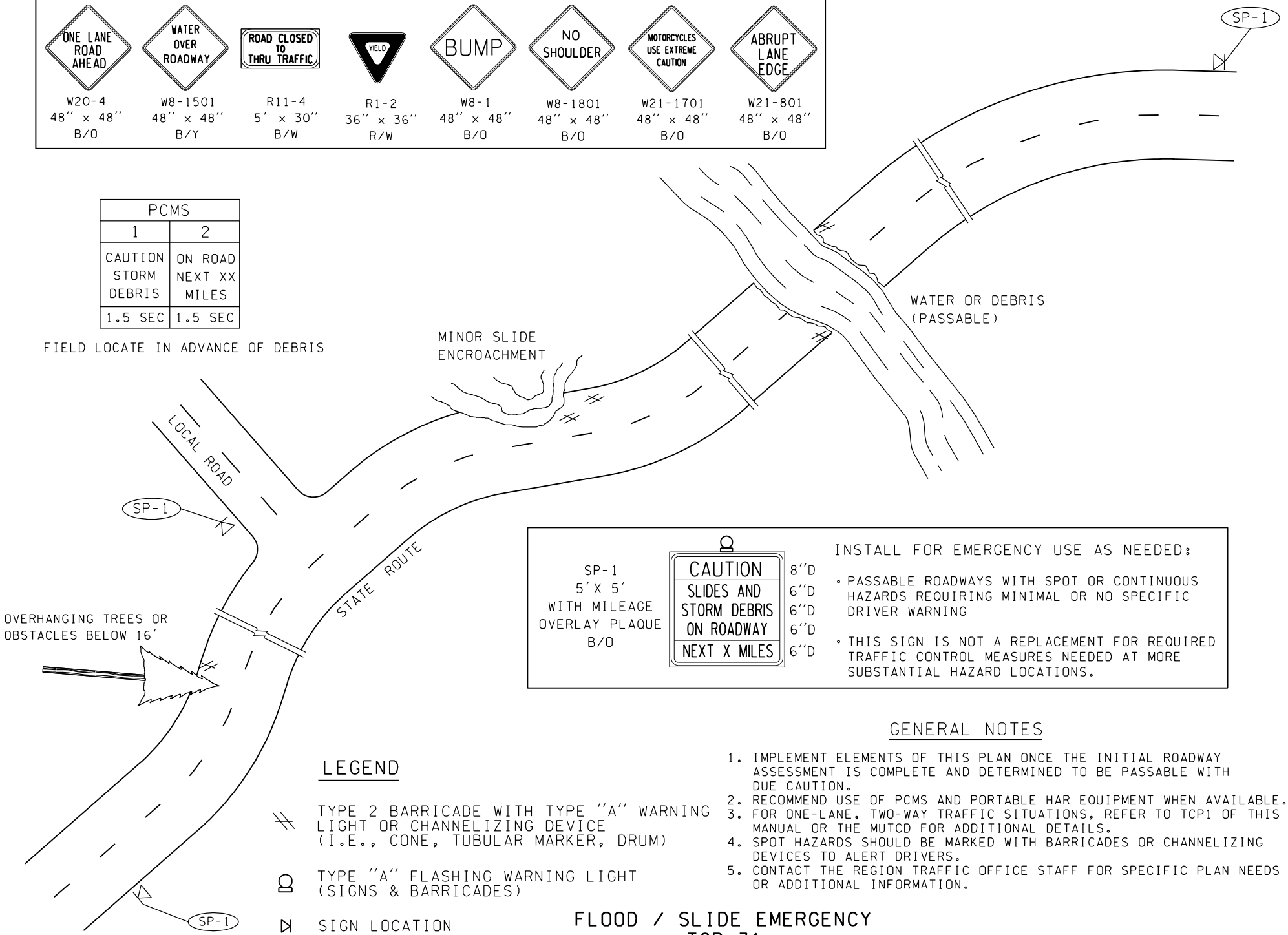
Response to an emergency situation is inherently more dangerous than planned situations. Do not expose yourself to a life-threatening situation. Wait for assistance and protect yourself at all times.

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

W20-4	W8-1501	R11-4	R1-2	W8-1	W8-1801	W21-1701	W21-801
48" x 48"	48" x 48"	5' x 30"	36" x 36"	48" x 48"	48" x 48"	48" x 48"	48" x 48"
B/O	B/Y	B/W	R/W	B/O	B/O	B/O	B/O

PCMS	
1	2
CAUTION STORM DEBRIS	ON ROAD NEXT XX MILES
1.5 SEC	1.5 SEC

FIELD LOCATE IN ADVANCE OF DEBRIS



SP-1
5'X 5'
WITH MILEAGE OVERLAY PLAQUE
B/O

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.

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

GENERAL NOTES

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

FLOOD / SLIDE EMERGENCY
TCP 31

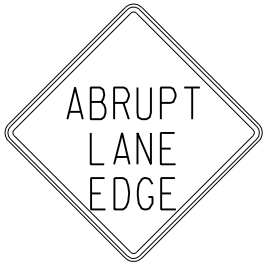
SPECIAL DETAILS AND TCP'S

Traffic Control Details (TCD's) 1 to 5

The following detail plans show the placement of signs, channelizing devices, and pavement markings, which are difficult to show on other traffic control plans or where additional guidance is necessary. A detail is also included as a guideline for signing a chip seal operation (TCD 4) and this includes an example reduced speed limit scenario. Be sure to include specific warning signs along with any reduction in the legal speed so the drivers have proper expectancy and know why they are being asked to slow down.

WARNING SIGNS

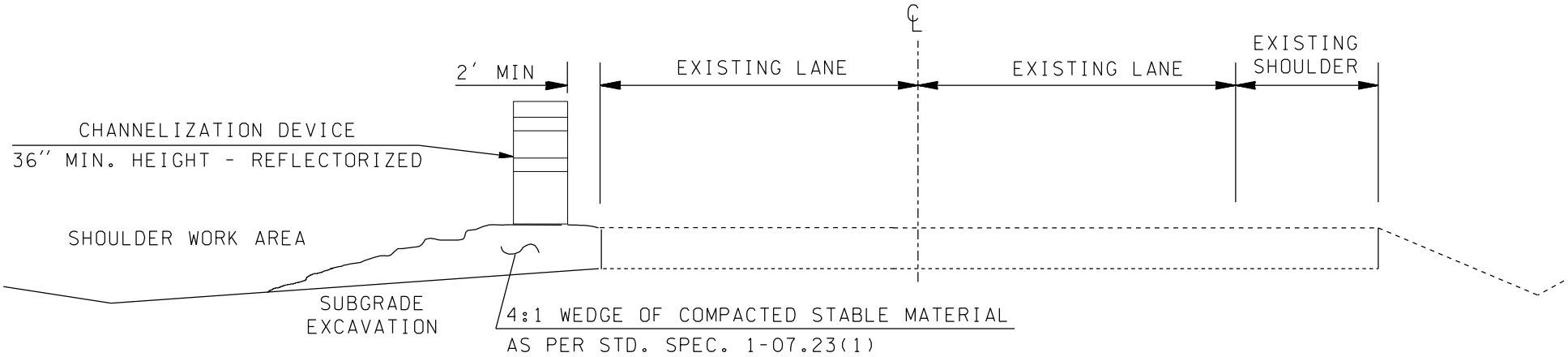
LOCATE AS NEEDED FOR SITE CONDITIONS
TO SUPPLEMENT WARNING SIGNS



W21-801
48" x 48"
B/O

W8-1801
48" x 48"
B/O

W21-1701
48" x 48"
B/O



OPERATIONAL NOTES

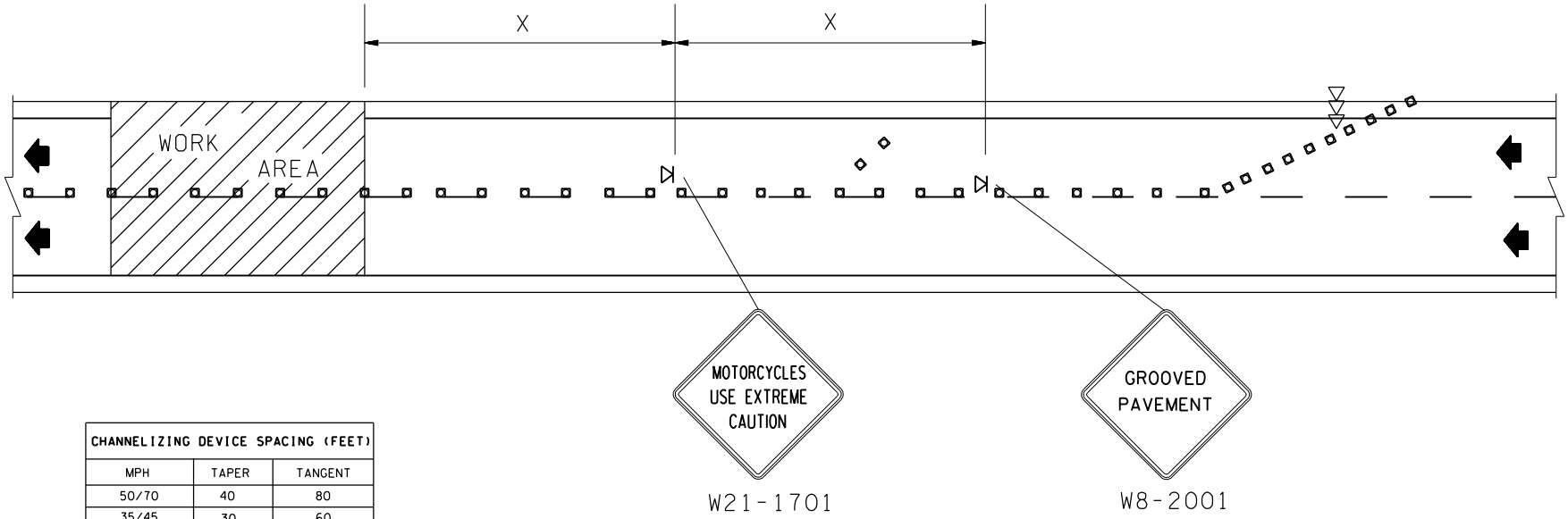
1. SHOULDER EXCAVATION SHALL BE LIMITED TO ONE SIDE OF ROADWAY AT A TIME.
2. TYPE "C" STEADY BURN LIGHTS ARE RECOMMENDED ON CHANNELIZATION DEVICES TO PROVIDE ADDITIONAL DELINEATION.
3. REFER TO STD. SPEC. 1-07.23 FOR ADDITIONAL DETAILS ON THE MITIGATION REQUIREMENTS FOR DROP OFF PROTECTION.

SHOULDER WORK AREA PROTECTION
NON-WORKING HOURS
TCD 1

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
Urban Streets	25 MPH or LESS	100'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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

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



CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/70	40	80
35/45	30	60
25/30	20	40

NOTES

1. REFER TO TCP3 FOR TYPICAL LANE CLOSURE SIGNING DETAILS, DEVICE SPACING REQUIREMENTS AND LANE CLOSURE TAPER LENGTHS.

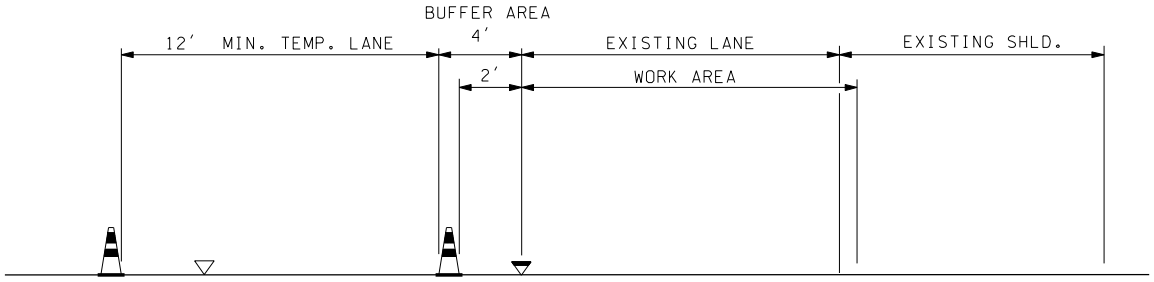
LEGEND

SIGN LOCATION

SEQUENTIAL ARROW SIGN

CHANNELIZING DEVICES

TYPICAL MOTORCYCLE SIGNING DETAIL
TCD 2



TYPICAL SECTION A-A

TEMPORARY TRAFFIC CONTROL DEVICES

EXISTING EDGE STRIPE

EXISTING LANE STRIPE

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
Urban Streets	25 MPH or LESS	100'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

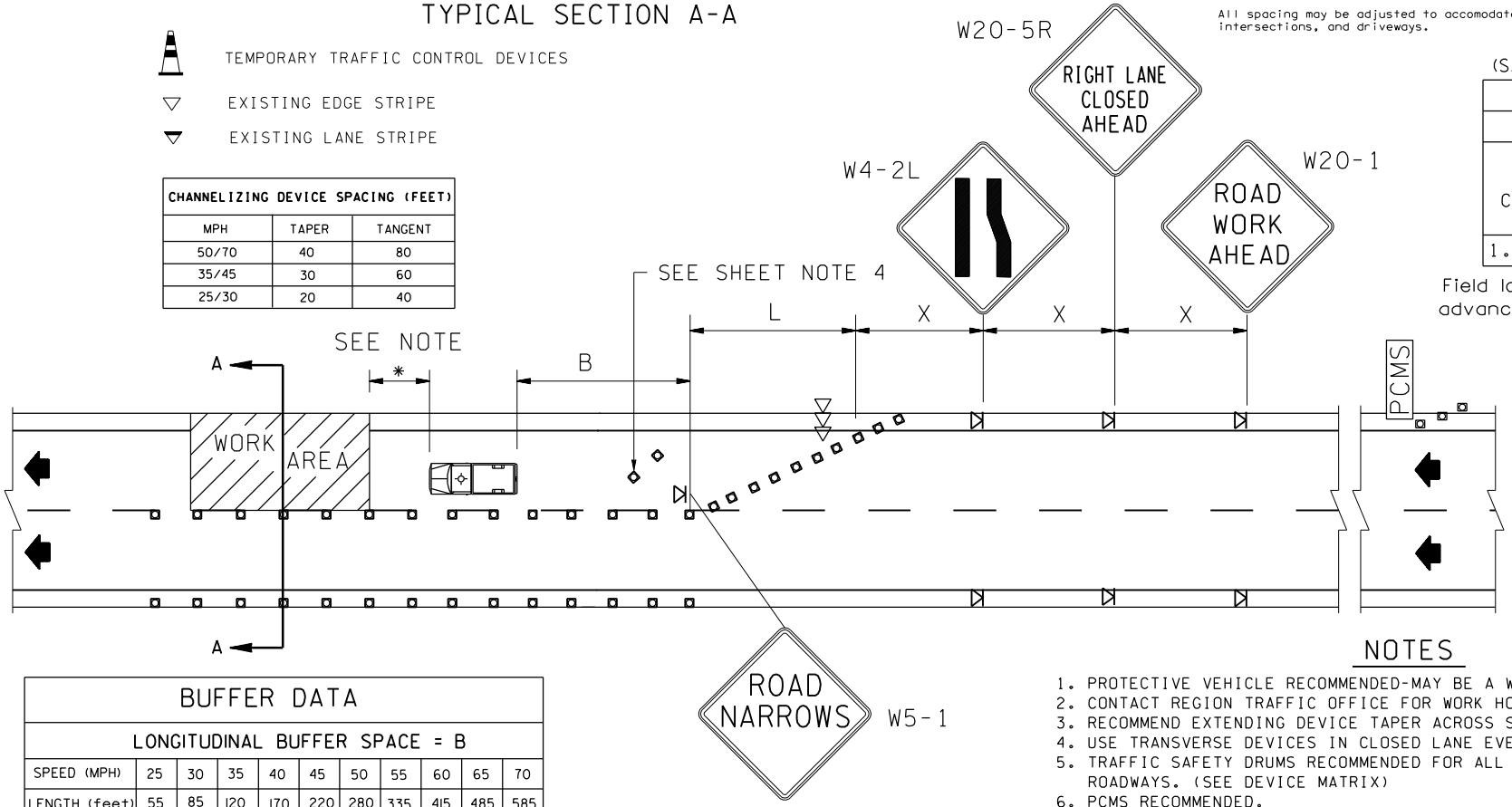
All spacing may be adjusted to accomodate interchange ramps, at-grade intersections, and driveways.

(SAMPLE MESSAGE)

PCMS	
1	2
LANE CLOSED	1 MILE AHEAD
1.5 SEC	1.5 SEC

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

CHANNELIZING DEVICE SPACING (FEET)		
MPH	TAPER	TANGENT
50/70	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)	55	85	120	170	220	280	335	415	485	585

PROTECTIVE VEHICLE WITH TMA ROLL AHEAD DISTANCE		
TYPICAL PROTECTIVE VEHICLE TYPE WITH TMA	TYPICAL PROTECTIVE VEHICLE (WITH TMA) LOADED WEIGHT (LBS)	STATIONARY OPERATION (feet)
4 YARD DUMP TRUCK, SERVICE TRUCK, FLAT BED, ETC.	MINIMUM WEIGHT 15,000 LBS. (MAXIMUM WEIGHT SHALL BE IN ACCORDANCE WITH MANUFACTURER RECOMMENDATION)	30 MIN.
ROLL AHEAD STOPPING DISTANCE ASSUMES DRY PAVEMENT		

• A PROTECTIVE VEHICLE IS RECOMMENDED REGARDLESS IF A TMA IS AVAILABLE. IF NO TMA IS USED, THE PROTECTIVE VEHICLE SHALL BE STRATEGICALLY LOCATED IN THE FIELD TO SHIELD WORKERS AND NO ROLL AHEAD DISTANCE IS SPECIFIED.

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

TYPICAL LANE CLOSURE WITH SHIFT
TCD 3

NOTES

1. PROTECTIVE VEHICLE RECOMMENDED-MAY BE A WORK VEHICLE.
2. CONTACT REGION TRAFFIC OFFICE FOR WORK HOUR RESTRICTIONS.
3. RECOMMEND EXTENDING DEVICE TAPER ACROSS SHOULDER.(L/3 TAPER)
4. USE TRANSVERSE DEVICES IN CLOSED LANE EVERY 1000'+- (RECOMMENDED).
5. TRAFFIC SAFETY DRUMS RECOMMENDED FOR ALL TAPERS ON HIGH SPEED ROADWAYS. (SEE DEVICE MATRIX)
6. PCMS RECOMMENDED.

LEGEND

WARNING BEACON - REQUIRED

SIGN LOCATION

SEQUENTIAL ARROW SIGN

CHANNELIZING DEVICES

PROTECTIVE VEHICLE - RECOMMENDED

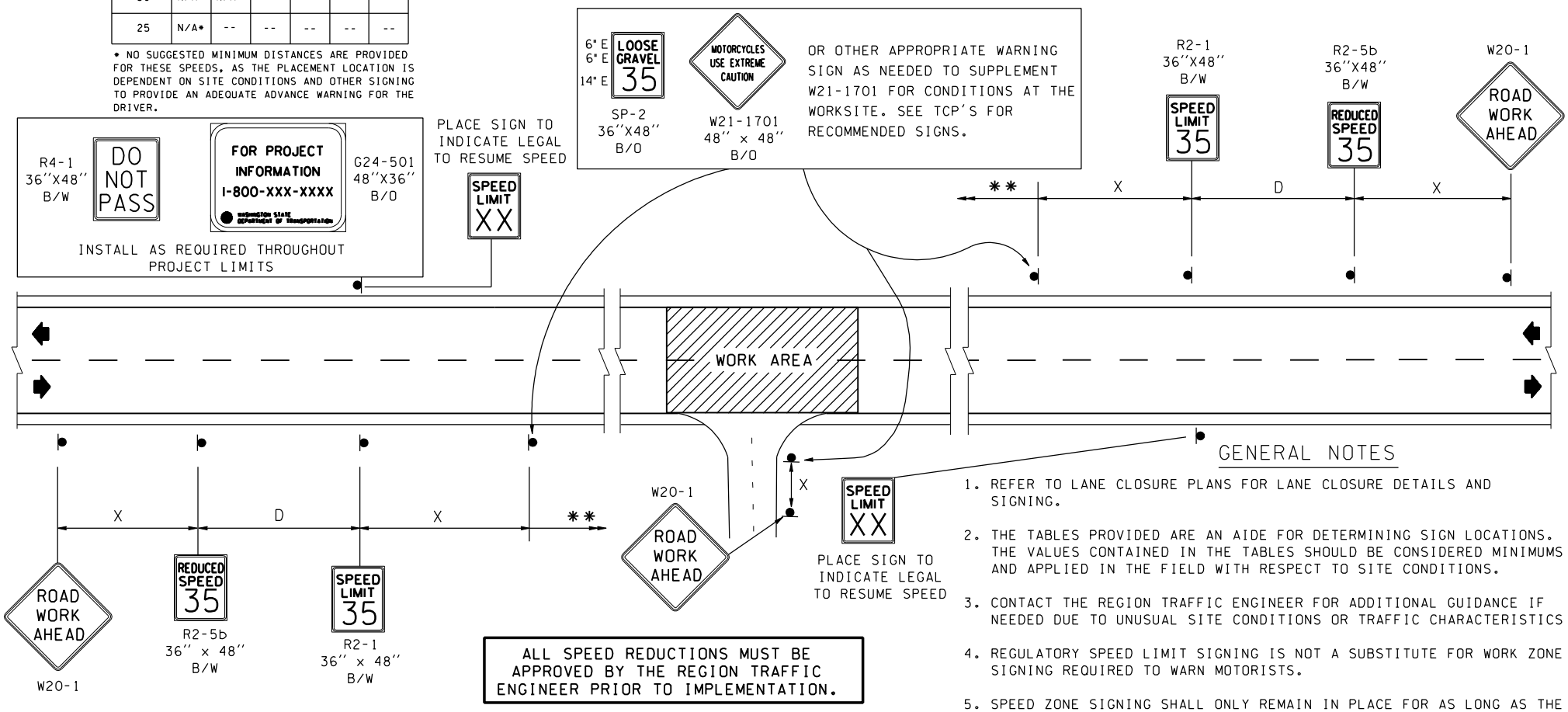
PCMS PORTABLE CHANGEABLE MESSAGE SIGN

POSTED SPEED	DECELERATION LENGTH NEEDED TO REACH LISTED ADVISORY SPEED - MPH = D					
	10	20	30	40	50	60
70	525	500	425	350	250	150
65	425	400	350	175	N/A*	N/A*
60	350	300	250	175	N/A*	--
55	275	225	175	100	N/A*	--
50	200	150	100	N/A*	--	--
45	125	N/A*	N/A*	--	--	--
40	N/A*	N/A*	N/A*	--	--	--
35	N/A*	N/A*	N/A*	--	--	--
30	N/A*	N/A*	--	--	--	--
25	N/A*	--	--	--	--	--

* NO SUGGESTED MINIMUM DISTANCES ARE PROVIDED FOR THESE SPEEDS, AS THE PLACEMENT LOCATION IS DEPENDENT ON SITE CONDITIONS AND OTHER SIGNING TO PROVIDE AN ADEQUATE ADVANCE WARNING FOR THE DRIVER.

SIGN SPACING = X (feet)		
Freeways & Expressways	55/70 MPH	1500'+- (OR AS PER MUTCD)
Rural Highways	60/65 MPH	1000'+-
Rural Roads	45/55 MPH	500'+-
Rural Roads & Urban Arterials	35/40 MPH	350'+-
Rural Roads, Urban Streets Residential & Business Districts	25/30 MPH	200'+-
Urban Streets	25 MPH or LESS	100'+-
ALL SIGNS ARE 48" x 48" BLACK ON ORANGE UNLESS OTHERWISE DESIGNATED.		

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



ALL SPEED REDUCTIONS MUST BE APPROVED BY THE REGION TRAFFIC ENGINEER PRIOR TO IMPLEMENTATION.

** CONTINUE SIGNS AS NEEDED BASED ON REQUIRED ROADWAY CONDITION WARNING AS SHOWN ON THE APPROPRIATE TCP.

LEGEND

- SIGN LOCATION
- WORK AREA LIMITS

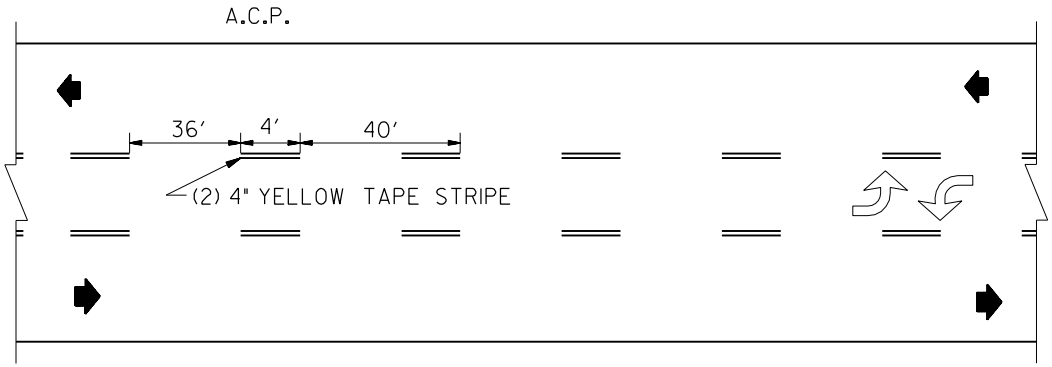
GENERAL NOTES

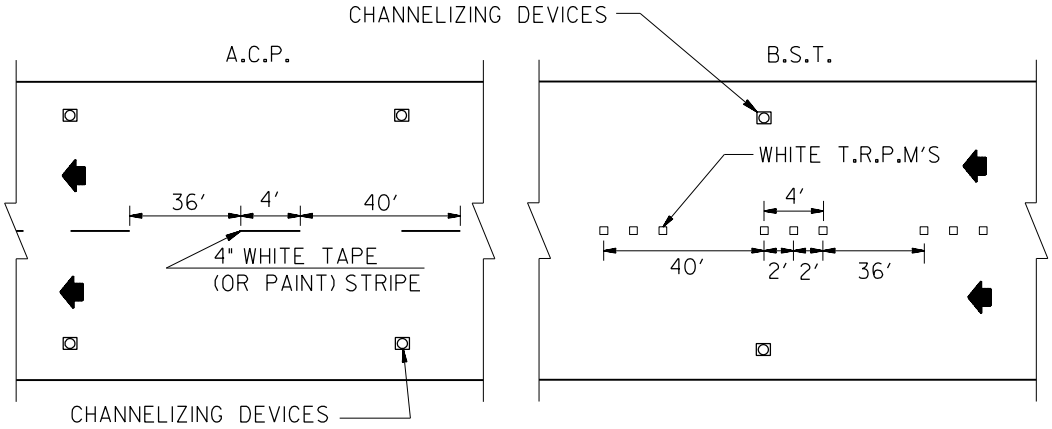
1. REFER TO LANE CLOSURE PLANS FOR LANE CLOSURE DETAILS AND SIGNING.
2. THE TABLES PROVIDED ARE AN AIDE FOR DETERMINING SIGN LOCATIONS. THE VALUES CONTAINED IN THE TABLES SHOULD BE CONSIDERED MINIMUMS AND APPLIED IN THE FIELD WITH RESPECT TO SITE CONDITIONS.
3. CONTACT THE REGION TRAFFIC ENGINEER FOR ADDITIONAL GUIDANCE IF NEEDED DUE TO UNUSUAL SITE CONDITIONS OR TRAFFIC CHARACTERISTICS
4. REGULATORY SPEED LIMIT SIGNING IS NOT A SUBSTITUTE FOR WORK ZONE SIGNING REQUIRED TO WARN MOTORISTS.
5. SPEED ZONE SIGNING SHALL ONLY REMAIN IN PLACE FOR AS LONG AS THE REDUCED SPEED CONDITION APPLIES.
6. CONTACT THE REGION TRAFFIC OFFICE FOR SPECIAL SIGN ORDERS, SPEED REDUCTION NOTICES, ETC.
7. SEE TCD1 FOR TEMPORARY PAVEMENT MARKING DETAILS.
8. MOTORCYCLE WARNING SIGNS ARE REQUIRED AS PER WAC 468-95-315.
9. **SPEED LIMIT REDUCTION SHALL CONFORM TO RCW 47.48.020**

TYPICAL SPEEDZONE DETAIL
CHIP SEAL PROJECTS
TCD 4

WORK OPERATIONS THAT REMOVE OR OBSCURE EXISTING PAVEMENT MARKINGS MUST PROVIDE FOR TEMPORARY MARKINGS UNTIL THE PERMANENT MARKINGS ARE APPLIED. PERMANENT MARKINGS SHALL BE INSTALLED WITHIN 2 WEEKS. THE DETAILS BELOW SHOW VARIOUS COMMON APPLICATIONS. CONTACT THE REGION TRAFFIC OFFICE STAFF FOR ASSISTANCE WITH MORE COMPLEX SITUATIONS.

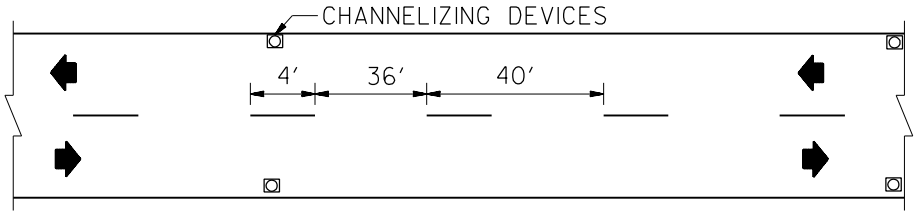
MULTI-LANE ROADWAYS



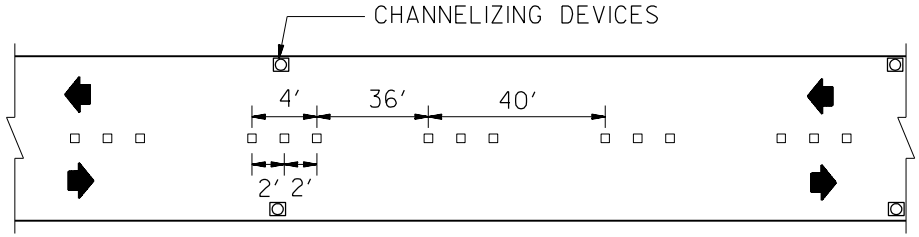


2 LANE ROADWAYS

A.C.P. OVERLAY - TEMPORARY STRIPING TAPE SHALL BE INSTALLED IN CONJUNCTION WITH "PASS WITH CARE" AND "DO NOT PASS" SIGN LOCATIONS.



A.C.P. OVERLAY - TEMPORARY STRIPING TAPE - 4" YELLOW CENTER STRIPE



B.S.T. OVERLAY - T.R.P.M.(CHIP SEAL MARKER) - 4" YELLOW CENTER STRIPE

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′+- TAPERS ½ L

T.R.P.M. = TEMPORARY RAISED PAVEMENT MARKER

TEMPORARY PAVEMENT MARKING DETAILS
TCD 5

Appendix

***** The following bulletins have been updated to meet current standards where applicable.***

Appendix 1-1 ***Flagger Safety*****

- New rules memo
- Summary of rules
- Flagger Hazard Awareness Briefing

Appendix 2-2 ***Work Zone Signs***

- Approved Type X sign sheeting examples

Appendix 3-3 ***Traffic Control Plans*****

Appendix 4-4 ***Channelizing Device Application Matrix***

Appendix 5-5 ***Worker Safety During Paving Operations***

WASHINGTON
Give'em a
BRAKE
Transportation and Utility Workers

Work Zone Safety Bulletin

FLAGGER SAFETY

Flagger safety is a top priority for WSDOT and much has happened in the past two years or so to improve flagger safety. This bulletin is intended to provide safety awareness and guidance on compliance to current standards. Those involved in flagging operations as a flagger, supervisor, crew member or manager need to be familiar with the requirements for work zone flagging operations. Flaggers tend to be more exposed to traffic and equipment hazards and the following guidance is intended to reduce exposure to those hazards.

Standards

The standards that apply to flagging operations are found in;

- Manual on Uniform Traffic Control Devices (MUTCD) Millennium Edition, Part 6
http://www.wsdot.wa.gov/biz/trafficoperations/pdf/6andi.pdf
- Work Zone Traffic Control Guidelines, M54-44
http://www.wsdot.wa.gov/fasc/EngineeringPublications/Manuals/Workzone.pdf
- Washington Administrative Code WAC 296-155-305
http://www.leg.wa.gov/wac/index.cfm?fuseaction=Section&Section=296-155-305

Knowledge and compliance to these standards is a necessary and important part of conducting safe flagging operations.

Guidance

The following guidance applies the above standards to WSDOT flagging operations and specifically addresses some of the hazards and practices.

- Use of flaggers should be limited as much as possible and only use flaggers when all other forms of traffic control are not appropriate or effective.
- Flagging from the center of an intersection (with or without a paddle) is not allowed. (law enforcement officers can direct traffic from the center of an intersection)
- Flagging on centerline of a roadway (surveying, inspection, pavement marking, etc.) without appropriate lane closure or lane shifting traffic control is not allowed.
- Unprotected flagging stations in close proximity to backing equipment is not allowed.
- Unprotected flagging stations in active traffic locations or work zones with activities such as hauling & loading, commercial access, multiple work activities & crews,

multiple traffic approaches or traffic approaching from behind the flagger are not allowed.

- Flagging stations with no escape route are not allowed unless positive protection is in place at the flagger station.
- Flagging at intersections where flagger direction and signal displays conflict are not allowed except for short duration work or emergencies. Signals should be turned off for longer duration flagging operations.
- Flagger stations must be illuminated at night.
- Flagger job site orientation is required prior to flagging. (see attached below "flagger hazard awareness briefing" and summary of rules)

The above listed issues are examples and not a complete list. All flagging operations must be evaluated for safety and standards compliance as part of a work planning process.

The following documents summarize WSDOT's implementation of the flagging WAC's.

newrulesmemo.doc summaryofrules.doc "ER trng card.doc"

Resources

Resources for alternatives to flagging traffic control are available through the Region Traffic Offices. Approved traffic control plans (TCP) are required for flagging, as with all work zones, and the flagging station must be incorporated into and be an integral part of the TCP. If the approved TCP's in the M54-44 or other approved plans do not adequately address a specific work zone, the Region Traffic Office should be contacted to assist with developing an acceptable TCP. The Region and HQ Safety Offices are also a resource for flagging guidance.

Additional guidance for;

- Short duration flagging
- Mobile & moving flagging
- Emergency flagging

is being developed and will be made available in the future.

Also, new flagging devices and methods are being evaluated. Such as;

- Portable signal systems
- Automated flagging devices
- Intrusion alarms and other warning devices
- Protective devices

Summary

Generally WSDOT does a good job of flagging in a safe and effective manner, but there are hazards that need to be addressed and new rules to comply with. With so much at stake.....***your life, a co-worker and others***, please take the time to consider this bulletin.

Washington State Department of Transportation

Memorandum

July 19, 2001

TO: Jerry Lenzi
Don Senn
John Okamoto
Randy Hain
Leonard Pittman
Donald Wagner

THRU: Brian Ziegler

FROM: Toby Rickman

SUBJECT: Implementation of L&I's Permanent Flagging Rules

On March 1, 2001, the Department of Labor and Industries enacted permanent rules aimed at improving the safety of highway workers. The rules enact many safety requirements that our department has already adopted for WSDOT operations and WSDOT projects for several years. There are, however, a few new requirements which will need to be introduced into our operations. Also, the previously enacted emergency rules of June 1, 2000, have either been incorporated into the permanent rules or have been eliminated. Supervisors should ensure that current flagging practices are in compliance with the new permanent rules.

The attached document provides implementation guidance on five requirements of the rules that are either new to WSDOT or require clarification. The department's approach to the issue of providing flaggers with adequate warning of objects approaching from behind is the most challenging of the new requirements.

The ideal solution to flagger safety in general is to limit the use of flaggers as much as possible and only use flaggers when all other forms of traffic control are not appropriate or are ineffective. Realistically much of our work, especially on two lane highways necessitates the use of flaggers. Knowing this, we must strategically locate flagging stations to provide the best overall level of safety for the flagger while providing effective flagging direction. The attached document provides guidance on combining methods, locations, protection and devices as dictated by work zone conditions, to improve flagger safety and comply with the new rules.

This information should be discussed periodically during safety meetings and flagger job site orientations to maintain flagger safety awareness and alertness at the forefront.

The attached information should receive wide dissemination to all organizations that use flaggers.

TR/FRN:frn
Attachment

cc: Doug MacDonald
Paula Hammond
Kevin Dayton
Ken Kirkland
Rex Swartz

SUMMARY OF NEW FLAGGER RULES
June 28, 2001

In accordance with new WAC safety standards effective March 1, 2001, the following summary addresses those changes that require action by WSDOT to achieve compliance. Several of the new safety standards were already part of WSDOT's standards and are now required for all flagging operations. This summary focuses only on those new standards that require a change to current WSDOT procedures and requirements or is in response to requests for clarification. Also, the previous emergency rules implemented June 1, 2000 are no longer in effect and have either been incorporated into the permanent rules or have been eliminated. Supervisors should ensure that current flagging practices are in compliance with the new permanent rules.

Contractors, utilities, developers and others conducting flagging operations must also comply with the new requirements. This does not mean that others outside of WSDOT will necessarily use the same compliance methods as WSDOT. WSDOT permits, plans, specifications and agreements may contain specific requirements for flagging operations that require compliance by others.

1) **WAC 296-155-205 (4b) Head Protection**
   This section adds a new requirement for flaggers on asphalt paving operations to comply with the requirements of WAC 296-155-305. Current WSDOT standards comply with this section except for the new requirement for "a high visibility hard hat that is marked with 12 square inches of retroreflective material applied to provide 360 degrees of visibility". This requirement applies to all flagging operations during hours of darkness. A minimum of 3 square inches of retroreflective white or yellow tape, can be applied to each of the 4 hard hat sides to gain compliance.

2) **WAC 296-155-305 Signaling and Flaggers**

   Section (8)
   This section adds the requirement that if flaggers cannot be positioned so they are not exposed to traffic or equipment approaching from behind, then flaggers must have adequate warning of these types of hazards approaching them from behind.

   WSDOT will address this requirement by only using flaggers when all other means of traffic control is not appropriate or effective. When flaggers are used, flagging stations will be strategically located to provide the best overall level of safety for the flagger, while providing effective flagging direction to traffic. Also, increased flagger awareness and alertness, using flagging procedures that minimize or eliminate the time a flagger has their back to traffic and by using spotters when backing WSDOT vehicles with restricted rear vision near a flagger will be used. A flagger awareness briefing will be conducted and incorporated into safety meetings, field "tool box" safety talks, etc. The attached "Flagger Hazard Awareness Briefing" message shall be read and discussed at the above mentioned safety meetings.

Some specific examples of devices and methods for protecting or warning flaggers from behind are:

- Concrete or water filled barriers
- Buffer vehicles
- Spotter (spotters should only be used when all other types of warning are not effective and any hazard to the spotter is exceeded by the hazards to an exposed flagger and/or work crew) a protected location for the spotter should be used when possible.
- Motion detectors with audible warning
- Larger or more "imposing" channelization devices or barricades placed to delineate the area around the flagging station. Also, more channelization devices on reduced spacing should be considered.
- Rumble strips that produce an audible warning.

A mirror attached to the flag paddle staff or the flaggers hard hat has been suggested, but is not recommended as an effective device by itself and could possibly be distracting. Also, standard equipment backup alarms which are already required on construction equipment do not comply with this requirement.

WSDOT believes that constant reminders of the need to safeguard flaggers from hazards through increased on-site awareness emphasis, strategic flagger station locations, improved flagging methods and use of protective devices, either individually or combined as dictated by the work zone and traffic conditions will improve flagger safety and comply with the new rule.

Section (9a)

This section requires that the flagger(s) receive an orientation that initially familiarizes the flagger with the job site and again when job site conditions or work operations change significantly. The orientation must include but is not limited to:

- The flagger's role and location on the job site
- Motor vehicles and equipment in operation on the site
- Job site traffic patterns
- Communication and signals to be used between flaggers, equipment operators and workers
- On-foot escape route
- Other hazards specific to the job site
- Compliance and adjustments to the traffic control plan that identifies the flagger stations

The intent of this rule is to incorporate the flagger(s) into the work zone operations and to ensure that all involved are aware of and comply with the operational procedures. Supervisors are responsible to document the details of the orientation.

Section (10)
This section defines the requirements for warning signs used for flagging operations. WSDOT currently complies with these requirements except for the following situation.

A 4 sign sequence is required for flagging on roadways with posted speeds of 45 MPH or higher. WSDOT's standard 4 sign sequence for "one lane road" situations is in compliance. However, there are situations other than "one lane road" where the 4 sign sequence is still required. These situations could be truck crossings, bridge work, surveying, etc. where flaggers are required to stop traffic for a short period of time. In these cases the most appropriate standard warning sign that reflects the roadway condition or work operation should be used in place of the "one lane road ahead" sign to comply with the 4 sign sequence requirement. These signs might be;

- Truck crossing
- Road machinery
- Utility work
- Survey crew
- Blasting
- 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" 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.

Section (11a)
This section requires illumination of flagging stations during hours of darkness, which is also a WSDOT standard. Contained within this section is an exemption from this illumination requirement for emergency situations. For purposes of this rule, "emergency" means an unforeseen occurrence endangering life, limb, or property. WSDOT further defines emergency operations in the Traffic Control Guidelines Book.

WSDOT currently does a good job of flagging traffic control. The fact that many of our flagging standards were incorporated into the new rules shows that we have been leaders in flagger safety. With so much at stake.....***the lives of our co-workers, contractors and other flaggers***, we must continue to raise awareness and implement effective procedures to protect them. Adding the above elements into our current procedures will provide an additional safety benefit.

The actual text of the WAC's can be found on line at the following link.

http://www.lni.wa.gov/wisha/regs/WAC296-155-305Flagger.htm

Many of the requirements of WAC 296-155-305 are referred to as "performance-based". This is intended to allow more than one solution while maintaining the intent of the rule and while addressing the specific type of work zone and hazards involved. Examples of non-mandatory suggestions to comply with requirements are provided and may be appropriate. Contact the Region Traffic Office or Operations Office for assistance with flagger safety issues or compliance with the new rules. The Traffic Control Guidelines Book, M54-44 will be updated to reflect these new requirements.

Flagger Hazard Awareness Briefing

Washington State work zone accident statistics show that flaggers are at greatest risk of being struck by traffic moving through a highway work zone. Flaggers also have risk of being struck by workzone vehicles and equipment while maintaining attention on traffic.

This calls for flaggers not only maintaining attention on moving traffic through the work zone safely, but also developing job skills and methods to maintain awareness of operations going on near their flagger station.

The following rules of conduct are key in developing job skills and methods to provide warning from objects approaching from the flaggers blind side.

1) Always be clearly visible to approaching traffic.

2) Always be aware of oncoming traffic.

3) Do not step into, or turn your back on, the traffic.

4) Stand on the shoulder of the road (toes facing the centerline) observing traffic and the work zone. Sometimes you may have to stand on the opposite side of the road to effectively direct traffic around the work area.

5) Stand alone.* Do not permit a group of workers to congregate around you.

6) Know your flagger station position and familiarize yourself with the nature of the work being performed.

7) Plan an escape route in the case of an emergency.

8) Stay alert. Be ready to respond to an emergency.

9) Keep your mind on your job. Be aware of the work in progress.

10) Position yourself to maintain focus on traffic and any work vehicles working near the flagger station.

11) Adjust your flagger station position as needed to increase your safety distance from work vehicles, while maintaining safe efficient movement of traffic through the work zone.

* Use of a spotter should be considered in certain, site specific, operations.

Please read and discuss this information at the flagger's job site orientation, any time the site conditions substantially change, and at least twice monthly. Supervisors must document who received this information and the date that they received it.

WASHINGTON
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Transportation and Utility Workers

Work Zone Safety Bulletin

WORK ZONE SIGNS

October 2001

Background & Process

The Work Zone Safety Task Force completed its review and discussion on the use of 36" signs vs. 48" signs in work zones. The Task Force felt it was necessary to resolve this issue establishing clear guidelines for using 48' signs in work zones, thus eliminating inconsistent uses statewide. The Task Force agreed that 48" signs should be the WSDOT standard. This also fits well with our current direction to increase the visibility and conspicuity of our work zone signs by using the new fluorescent orange sign sheeting material.

The Headquarters Maintenance Office conducted a statewide survey to determine the sizes of signs currently used in work zones. Their survey indicated a mixture of the two sign sizes still being used across the state. Feedback from those surveyed, plus input from the maintenance and operations members of the Task Force identified the following issues:

- 48" signs can be more difficult to place in narrow or no shoulder locations, but it can be done.
- New portable sign stands may be needed in some cases to allow 48" sign placement.
- Many of the new NCHRP 350 approved sign stands have adjustable "all terrain" bases and legs.
- 48" signs may require more ballast than 36" signs used in windy areas.
- Current use of 36" signs may be due to long standing procedures that inadvertently were not updated or used by specialized crews that felt the smaller signs were needed due to site conditions.
- Also, the 48" standard may not have been consistently communicated across the state.

Standards
Current state and federal standards were reviewed to determine the correct standard. In this case the standards of the MUTCD apply, specifically part VI, 6F-1(2) paragraphs 4 and 5 as follows:

> *Where any part of the roadway is obstructed or closed, advance warning signs are required to alert traffic well in advance of these obstructions or restrictions. These signs may be used singly or in combination. Because of their importance, they* ***shall have a standard size of 48 inches square*** *and shall be the standard diamond shape for warning signs, except as provided above (standard sizes & allowance for larger signs). Signs larger than 48 inches square may be used for additional emphasis of the temporary traffic control zone.*
> *Where speeds and volumes are moderately low, a minimum size of 36 inches square may be used for advance warning signs, if they have a minimum letter size of 5 inches.*

Use of 36" signs would have to meet the "low speed and volume" criteria stated in paragraph 5 of the MUTCD. Although not specifically indicated, low speed is generally 40 mph or less. Low volume is a relative term, but for application to state routes 2000 ADT could be considered the upper limit. The "Millennium Edition" of the MUTCD (MUTCD 2000) maintains the same standard as the current MUTCD and references the 48" signs as a ***standard*** condition, which is the new terminology equivalent of the *shall* condition. The Work Zone Traffic Control Guidelines Book, M54-44 also refers to "standard" as being 48" x 48" signs".

Implementation
Work crews need to be aware of this standard and action should be initiated to replace existing 36" (or smaller) signs with 48" signs as needed. Even though the use of 48" signs have been the MUTCD standard for some time (since 1978) a reasonable timeframe to determine the need for new signs and reach full implementation is needed as follows:

- Determine the number and type of signs that need to be replaced with 48" signs
- Determine any additional equipment needed to accommodate the new 48" signs; NCHRP 350 compliant sign stands, shop or work vehicle storage & transporting equipment, additional sand bag ballast, etc.
- New signs should be fabricated with fluorescent orange sheeting
- Full implementation should be accomplished by the end of the current biennium
- Deviations may be allowed on a case by case basis to use 36" signs instead of 48" Signs based on actual conflicts that are justified and documented. Deviations will not be allowed for convenience or continuation of existing procedures.

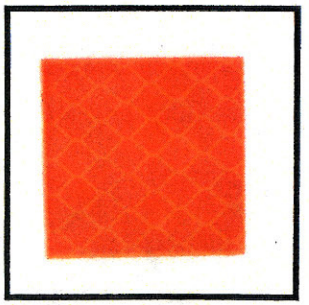
This requirement applies to all work zones, including construction projects, utility work, survey crews, developers and others. We realize construction projects are generally covered by specifications and plans. Other work zones may require further oversight to ensure compliance with this requirement.

Reaching compliance with the 48" sign standard will require additional effort as the larger signs are integrated into our already established procedures. Compliance is required, but we also need to recognize the benefits gained in reduced liability risk and improved safety.

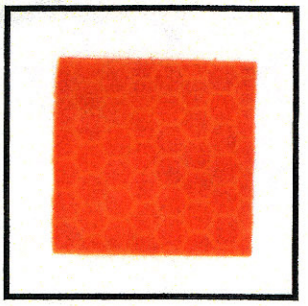
Contact Frank Newboles, State Work Zone and Safety Manager, by e-mail or at (360) 705-7392 for any questions.

Washington State
Department of Transportation

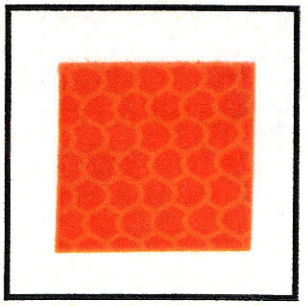
APPROVED FLUORESCENT ORANGE SIGN SHEETING TYPE X



3M – Scotchlite "Diamond Grade" 3924, (Formerly Type VII)



Avery Dennison – "Super High Performance" W-7514, (Formerly Type IV)



Nippon Carbide – Nikkalite "Crystal Grade" Series 94047, (Formerly Type IV)

WORK ZONE SAFETY BULLETIN

WORK ZONE SAFETY TASK FORCE
April 5, 2002

TRAFFIC CONTROL PLANS (TCP's)

TCP's are a required and necessary component of most work zones and may be the single most important tool for safe and effective traffic control operations when used appropriately. The following information explains the requirements for use of TCP's.

The following requirements are the ***minimum allowed***. Supervisors must consider all work zone conditions and determine if additional traffic control and protective measures are needed. A TCP that accurately depicts the work zone and traffic control measures needed to safely provide for all traffic movements, traffic mobility and worker safety must be selected and implemented. The requirements for the following types of work zones provide the basic compliance level for most operations.

- Work zones (including all workers, materials and equipment) that are;
    - Behind approved traffic barriers
    - More than 2 feet behind a curb
    - 15 feet or more from the roadway shoulder

  May not need traffic control devices or a TCP, if approved by the crew supervisor. *This is the only type of work zone that does not require advance warning to drivers. All other work zones require advance warning as appropriate; hazard beacon, signs, etc.*
- Intermittent work operations that use short stops of up to 15 minutes that are;
    - At low volume locations, or
    - At low speed locations, or (40 MPH or less)
    - On the roadway shoulder

  May not need traffic control devices, (other than the work vehicle warning beacon) or TCP if approved by the crew supervisor. *60 minutes is the maximum time limit allowed if several intermittent work operations and locations are conducted within a 1-mile area. (See short duration or stationary work operation requirements.)*
- Short Duration work operations lasting up to 60 minutes that are;
    - At low volume locations, or
    - At low speed locations, or (40 MPH or less)
    - On the roadway shoulder

  May use simplified traffic control procedures, but still require an approved TCP.
- Long Term work operations lasting over 1 hour all require TCP's.
- Mobile work operations that generally move continuously at low speeds may require specialized TCP's to address the operations specific needs. The supervisor must ensure that an approved TCP is utilized.
- Operations that use flaggers must incorporate the flagger station and all other flagging requirements into the work operation. More than one TCP may be used if appropriate.

- Emergency response traffic control requirements allow the use of the best available devices for the first hour. Emergency response that lasts for more than an hour should implement appropriate traffic control measures in coordination with the on site emergency services authority. (see the Traffic Control Guidelines Book M54-44)
- Special work operations, such as;
  - Survey Crews
  - Roadway Testing Crews
  - Inspection
  - Traffic Data Collection

  Are all required to use an approved TCP that conforms to the above listed requirements. Supervisors of these crews must ensure that appropriate TCP's are used.
- Work zone conditions are just as important as using the correct TCP and must be considered when selecting the TCP and planning for the work operation. Conditions such as;
  - High volume traffic hours
  - Weather conditions
  - Pedestrians and Bikes

Resources for TCP's, development and approval are available through;

- Traffic Control Guidelines Book, M54-44
- MUTCD Part VI
- Region Traffic Office

TCP's provide a focus point for supervisors and crews to plan ahead for the needed equipment, address work zone safety and traffic conditions and get all crew members on the same page. The TCP is also a reminder of what standards are involved and is your best evidence of compliance to those standards.

Remember, TCP's do not necessarily have to be complex or require lots of development time for every operation. Basic operations may be able to use the preapproved TCP's from the Traffic Control Guidelines Book (or slightly modified version) or other TCP's based on the MUTCD Part VI typical application diagrams. Original, specific, highly modified or complex TCP's should be developed in coordination with and approved by the Region Traffic Office.

The following excuses for not using or complying with the above TCP requirements are not acceptable and won't save you from an L&I citation, Law Enforcement citation, lawsuit, department corrective action, or worse yet a death or injury resulting from a work zone crash.

- "we've always done it this way"
- "we didn't have enough cones"
- "we didn't have the right signs"
- "we've never had a problem before"

Supervisors and Crew Members, consider this bulletin as a reminder to take the opportunity to review your work operations and ensure that the correct TCP's are in use. Many work zone operations take place in a harsh and unforgiving environment. The very nature of our work presents hazards that we all must recognize and take proper action to minimize the potential for an incident.

CHANNELIZING DEVICE APPLICATION MATRIX

Device Type	Low Speed (40 mph or less)	High Speed (45 mph or greater)
Cones -Tangent	✓	✓
Cones -Taper	✓	**A***
Tall Channelizing Devices - Tangent	✓	✓
Tall Channelizing Devices - Taper	✓	✓*
Drums - Tangent	✓	✓
Drums - Taper	✓	**R**
Tubular Markers	✓	✗*

A - Allowed, consider using a more visible device **R** - Recommended device
✓ **-** May be used in this situation ✗ - Requires approval by Region Traffic Engineer
* - Double the amount of devices in taper, use DOUBLE SPACING column shown below (20')

CHANNELIZING DEVICE SPACING CHART (FEET)			
MPH	*DOUBLE SPACING*	TAPER	TANGENT
45/70	20	40	80
35/40	N/A	30	60
20/30	N/A	20	40

Design of Channelization Devices (see MUTCD Part VI and appropriate sections of this manual for additional guidance)

- All channelizing devices must comply with the requirements of the MUTCD and the NCHRP 350 traffic control device crash performance requirements.
- Cones – Freeway, high speed and night use requires 28" minimum height cones with 2 white retroreflective bands. Low speed daytime use allows 18" cones without retroreflective bands.
- Tall Channelizing Devices – 42" in height, minimum, using a tapered cone type shape of consistent dimensions regardless of orientation to traffic. A minimum of 2 white and 2 orange retroreflective horizontal stripes 6 inches wide. Designs that provide for secure mounting of a warning light are allowed.
- Drums – 36" in height and at least 18" wide of consistent dimensions regardless of orientation to traffic. A minimum of 2 white and 2 orange retroreflective horizontal stripes 4 to 6 inches wide. Designs that provide for secure mounting of a warning light are allowed.
- Tubular markers- Tubular markers should only be used where space restrictions do not allow for the use of other more visible devices or where specific conditions such as high wind may require a device that can be glued in place. Tubular markers may be used to divide opposing traffic lanes, divide open lanes in the same direction and to delineate the edge of a pavement drop off. A 2" minimum width is required. Freeway, high speed and night use requires a 28" minimum height with 2 white retroreflective bands. Low speed daytime use allows 18" tubular markers with 1 retroreflective band.

Known suppliers of tall channelizing devices: (others may be available)

Traffix Devices http://www.traffixdevices.com/

3D Traffic Works http://www.trafficwks.com/product/twprod.html

Bent Manufacturing http://www.bentmfg.com/

PSS http://www.plasticsafety.com/nav.asp

Washington State
Department of Transportation

Memorandum

Date: June 1, 2004

TO: Regional Construction Engineers

THRU: Kevin Dayton

FROM: Rex Swartz RSW

SUBJECT: Statewide Initiative on Worker Safety During Paving Operations

The safety of those who work, drive, walk, and pedal in roadway work zones is of the highest priority. A well-planned and implemented work zone must safely provide for all users. In many cases, workers are exposed to the hazards involved with the actual work operation as well as moving traffic. Given this level of exposure to hazards, careful consideration must be given to effective methods of worker protection or hazard elimination.

Work zone safety for WSDOT inspection crews is a constant concern that deserves particular attention when we recognize an opportunity to make the work zone safer. One such opportunity is the safety of the asphalt density testers and others who follow the paving train during our paving operations. Our testers typically work alone, with minimal visibility and protection from traffic.

Paving Operations - Paving operations are very dynamic in that there is constant movement of equipment and workers, sometimes involved in many different activities. These operations can also become elongated as the work progresses. The advance work of layout and tacking followed by paving, rolling and testing can create a quite lengthy work area. In many cases, there is not sufficient lateral space to position a protective vehicle, and it is quite likely that one protective vehicle will not be sufficient to protect all the workers. Consideration must be given to the individual work and inspection activities and how safety might be improved by coordinating these activities with the best time and location. An example might be to conduct density testing when the pavement is cool enough to position a protective vehicle.

Consideration must be given to using work zone techniques that will improve safety for our testers, especially now as we continue to increase the amount of work we do at nighttime. As a minimum, all personnel must be aware of, and practice smart work zone habits, such as:

- During nighttime operations, always wear the proper nighttime safety apparel, including high visibility vest and pants (class III ensemble), hardhat with reflective tape and high visibility rain gear when necessary. All safety apparel must be maintained in a like-new condition.
- Be clearly visible to approaching traffic at all times. Motorists should be able to see you from a minimum of 390 meters (1,280 feet) away.
- Always be aware of oncoming traffic.
- Do not step into, or turn your back to traffic.

In addition, we need to consider how to best equip and position work vehicles and other devices to provide added protection.

Work Vehicle – All work vehicles must be equipped with an approved and operational flashing beacon and further, vehicles dedicated to work zone use may be equipped with full light bars to improve conspicuity. Work activities need to take place in close proximity to the work vehicle where feasible, since worker safety can be jeopardized if motorists' attention is focused on the work vehicle and beacon and the worker is at an unexpected location. The vehicle should be parked while in gear with the parking brake set and the front wheels turned away from the work area such that the after-impact trajectory is toward a safe area. The vehicle should be positioned to shield the worker from approaching traffic, if possible.

TMA Vehicle – The use of a Truck-Mounted Attenuator (TMA) is recommended in high-speed, multi-lane roadway work zones. The TMA is to be used in conjunction with the work vehicle. The TMA must be positioned a sufficient distance in front of the work area being protected to allow for appropriate vehicle roll-ahead after impact, but not so far that an errant vehicle will travel around the TMA and enter the work area, where feasible. Paving projects should consider including contractor-furnished and -operated TMAs on the project.

Supplemental Devices – Strategic use of work zone devices can help delineate the work area and provide additional advance warning to workers if an errant vehicle encroaches into the work area:

- **Lighting** – providing better lighting for the work area by use of portable light devices or enhanced vehicle-mounted lighting can be used to make our testers more visible to motorists. Care must be taken when using these light plants to ensure the glare to oncoming motorists is minimized.
- **Barrel Array** – placing a taper of channelizing devices in the closed lane in advance of the work area and work vehicle can provide a measure of added protection.
- **New Technology** – keeping an open mind to new or innovative approaches to work zone safety, is important and encouraged. The Region Traffic office is available to discuss and help coordinate use of such devices.

Remember, even though this testing takes only a short time, it is still a short duration work zone and the following requirements need to be addressed:

- Work should be done only in a lane closed to traffic,
- Channelizing devices should be considered to separate the work area from traffic, and
- Isolated locations require advanced warning to drivers, such as warning lights or signs.

As you move into this year's paving season, please plan ahead and make appropriate changes to your work operations. Please work with the Traffic Office when making revisions to your work zone configuration.

RWS:mce