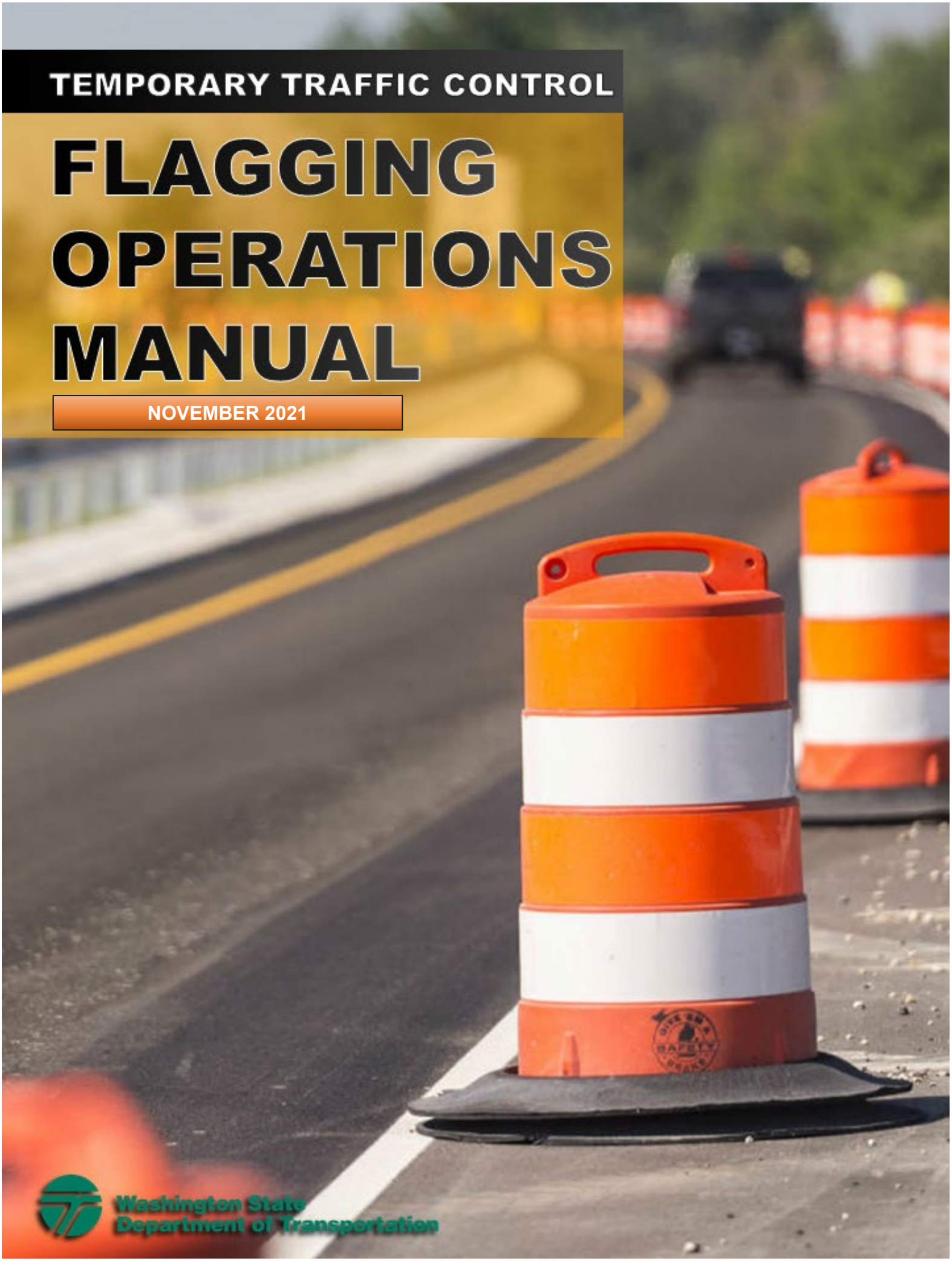
TEMPORARY TRAFFIC CONTROL

FLAGGING OPERATIONS MANUAL

NOVEMBER 2021



Washington State Department of Transportation

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Table of Contents

Introduction

This book was created to be used for training the flagger to work safely and to protect the safety of others.

Flaggers are a vital role in the successful operations of all maintenance, construction, and utility projects. Flaggers shall need to know the information within this book well enough that it becomes second nature.

Flaggers are required when all other methods of traffic control are not enough to control the situation, and the impacts of the temporary traffic control zone.

Your fellow workers and the road users depend on your ability to stay alert while controlling traffic using your visual movements along with your “Stop/Slow” paddle.

As a flagger the actions you take reflect on yourself as well as your employer. You are often the initial point of contact the traveling public will have with the work zone.

While performing your flagging duties you shall be efficient, responsible, and conducting yourself in a safe and professional manner at all times.

How It Works

- Functions and responsibilities of a professional trained flagger include:
- Guiding all road users safely through the work area.
- Protecting workers lives by recognizing dangerous traffic situations, and warning the crew within the area should a hazard present itself.
- Avoid inhibiting the traveling public as much as possible.
- Giving clear concise directions to road users.
- Allowing for adequate distance for road users to recognize signs, signals, and to come to a complete stop.
- Utilizing approved safety equipment to remain highly visible to traffic during the day or night-time conditions.
- Meeting all Federal, State, and Local requirements.

Upon successful completion of an approved training course, with a passing grade of 80% or higher, you will receive a wallet sized certification card. This certification card will be valid for three years from the date of the course.

This card must be kept on your person when performing any flagging duties. Flagging cards issued in Washington State are accepted in Oregon, Montana, and Idaho. Flagging cards from Oregon, Montana, and Idaho are also accepted in Washington State as acceptable certification.

Chapter One:

Federal, State, and Local requirements

1.1 Federal Guidelines

The traffic control requirements created at the Federal level is defined by the standards set in the Manual on Uniform Traffic Control Devices. This is referred to as the MUTCD.

The MUTCD is a document published by the Federal Highway Administration that sets a standard for traffic control practices for the whole country on all public streets, highways, bikeways, country and private roads that may be open to public travel. States are required to adopt the MUTCD as their legal state standard within two years of the most current publication date, or create their own standards that meet or exceed what is written in the MUTCD.

Part 6E of the MUTCD covers the flagger's responsibilities and methods of operations.

The standards set in the MUTCD create a level of compliance defined as:

- **Standard:** "shall" conditions
- **Guidance:** "should" conditions
- **Option:** "may" conditions
- **Support:** descriptive and/or general information

1.2 Washington State Modifications to the MUTCD

Washington State Department of Transportation has adopted the 2009 MUTCD per the Washington State Administrative Code 468-95-010 with modifications to Part 6 per 468-95-300 to WAC 468-95-317. Washington Department of Labor and Industries has passed the Washington State Administrative Code 296-155-305. It is commonly referred to as the WAC codes. The rules and regulations created in the Washington State Administrative Codes meet and exceed standards set in the MUTCD, and are to be the default standards to follow in Washington.

AMEND SECTION

WAC 468-95-300 Temporary traffic control. Amend MUTCD Table 6C-1 to read:

Sign Spacing (1)

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

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

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

NEW SECTION

WAC 468-95-301 Tapers. Add a new MUTCD Table 6C-5, Channelization Device Spacing, to Section 6C.08 to read:

Channelizing Device Spacing (Feet)

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

NEW SECTION

WAC 468-95-3015 Flagger procedures. Add a new Standard to MUTCD Section 6E.07 to read:

Standard:

Flagger directions at signalized intersections shall not be in conflict with signal displays and the signal must be either shut down or placed in flash mode as appropriate for the intersection operation except during emergencies.

NEW SECTION

WAC 468-95-302 Flagger stations. Add a new Standard to MUTCD Section 6E.08 to read:

Standard:

A single flagger shall not flag from the center of an intersection, except when there is an emergency or when law enforcement is flagging. When flagging at an intersection there shall be a flagger controlling each intersection leg.

NEW SECTION

WAC 468-95-305 Motorcycle construction warning sign. Pursuant to RCW 47.36.200, a warning sign displaying the word message MOTORCYCLES USE EXTREME CAUTION is added to MUTCD Figure 6F-4. The sign shall be diamond shaped with black letters on an orange background.

AMEND SECTION

WAC 468-95-306 Motorcycles use extreme caution supplemental plaque. Pursuant to RCW 47.36.200, amend MUTCD Section 6F.54 to read:

A supplemental plaque displaying the message MOTORCYCLES USE EXTREME CAUTION is added to MUTCD Figure 6F-4. Delete the Motorcycle symbol (W8-15P) plaque from Figure 6F-4.

The MOTORCYCLES USE EXTREME CAUTION (W21-1701P) plaque (see Figure 6F-4) may be mounted below a LOOSE GRAVEL (W8-7) sign, a GROOVED PAVEMENT (W8-15) sign, a ABRUPT LANE EDGE (W21-801), a METAL BRIDGE DECK (W8-16) sign, or a STEEL PLATE AHEAD (W8-24) sign if the warning is intended to be directed primarily to motorcyclists.

NEW SECTION

WAC 468-95-307 Abrupt lane edge warning sign. A warning sign displaying the word message ABRUPT LANE EDGE is added to MUTCD Figure 6F-4. The sign shall be diamond shaped with black letters on an orange background.

The sign shall be used where Section 1-07.23(1) of the Washington state department of transportation's standard specifications require warning signs to alert drivers about an elevation differential between lanes or between the outside lane and the shoulder.

1.3 WAC 296-155-305 Part E Signaling and Flaggers

(Complete WAC 296-155-305 located in Appendix E)

Definition:

Flagger means a person who provides temporary traffic control.

For the purposes of this chapter, MUTCD means the Federal Highway Administration's Manual on Uniform Traffic Control as currently modified and adopted by the Washington State Department of Transportation.

Link: For the current version of the MUTCD, see the Department of Transportation's website at http://www.wsdot.wa.gov/Operations/Traffic/mutcd.htm .

(1) General requirements for signaling and flaggers.

(a) Employers must first apply the requirements in this section. Then you must set up and use temporary traffic controls according to the guidelines and recommendations in Part VI of the MUTCD.

(b) Job site workers with specific traffic control responsibilities must be trained in traffic control techniques, device usage, and placement.

Note: You may view and print a copy of the MUTCD at the following website:

http//www.wsdot.wa.gov/Operations/Traffic/mutcd.htm

(2) When to use flaggers.

- Flaggers are to be used only when other reasonable traffic control methods will not adequately control traffic in the work zone.

- If signs, signals, and barricades do not provide necessary protection from traffic at work zones and construction sites on or adjacent to a highway or street, then you must use flaggers or other appropriate traffic controls

(3) Flagger signaling

- Flagger signaling must be with sign paddles approved by WSDOT and conform to guidelines and recommendations of the MUTCD.

- Sign paddles must comply with the requirements of the MUTCD.

- When flagging is done during periods of darkness, sign paddles must be retroreflective or illuminated in the same manner as signs.

- During emergency situations, red flags, meeting the specifications of the MUTCD, may be used to draw a driver's attention to particularly hazardous conditions. In non-emergency situations, a red flag may be held in the flagger's free hand to supplement the use of a sign paddle.

(4) Adequate warning of approaching vehicles.

You must

- Position work zone flaggers so they are not exposed to traffic or equipment approaching them from behind.
- If this is not possible, then the employer, responsible contractor, and/or project owner must develop and use a method to ensure that flaggers have adequate visual warning of traffic and equipment approaching from behind.

Note: The following are some optional examples of methods that may be used to adequately warn or protect flaggers:

Mount a mirror on the flagger's hard hat

- Use an observer
- Use a "jersey" barrier
- The department recognizes the importance of adequately trained flaggers and supports industry efforts to improve the quality of flagger training. However, training alone is not sufficient to comply with the statutory requirement of revising flagger safety standards to improve options available that ensure flagger safety

and that flaggers have adequate visual warning of objects approaching from behind them.

1.4 Safety Apparel

Definition: For the purposes of this rule, **hours of darkness** means one-half hour before sunset to one-half hour after sunrise.

For daytime and nighttime activity, flaggers shall wear high-visibility safety apparel that is labeled and meets the Performance Class 2 or Class 3 risk exposure requirements of the ANSI/ISEA 107–2015 or later publication entitled "American National Standard for High-Visibility Apparel and Headwear".

The apparel background (outer) material color shall be fluorescent orange-red, fluorescent yellow-green, or a combination of the two as defined in the ANSI/ISEA standard. The retroreflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 1,000 feet. The retroreflective safety apparel shall be designed to clearly identify the wearer as a person.

All employees shall wear sturdy approved work boots. All employees will wear ANSI/ISEA 107-2015 or newer Class 2 or Class 3 apparel on all job sites pertaining to flagging operations.

The hard hat shall be high-visibility and marked with at least 12 square inches of retro-reflective tape applied to provide 360 degrees of visibility at night. The acceptable high visibility colors are white, yellow, yellow-green, orange or red.

(Above)

Examples of approved hard hats with high-visibility retro-reflective tape

(Left Side)

Fluorescent yellow-green retro-reflective vest

All personal protective equipment (PPE) must be kept clean and in an acceptable condition as defined in the "*Quality Guidelines for Temporary Traffic Control Devices"*. Personal protective equipment determined to be "not acceptable" is required to be replaced. Limited copies of the Quality Guidelines book may be obtained from the American Traffic Safety Services Association (www.atssa.com).

For nighttime activity, high-visibility safety apparel that meets the Performance Class 3 requirements of the ANSI/ISEA 107–2015 or later publication entitled "American National Standard for High-Visibility Apparel and Headwear" and

labeled as meeting the ANSI/ISEA 107-2015 or later standard performance for Class 3 risk exposure should be considered for flagger wear.

1.5 Clothing and Other Considerations

Clothing

- Shirts with either long or short sleeves (no sleeveless shirts)
- Garments with hoods that restrict visibility shall not be worn while flagging
- Long pants in all weather

Additional Supplies

(a) Valid Washington State Traffic Control Flagger Card; or a valid card from Oregon, Idaho, Montana
(b) Whistle/air Horn
(c) Flashlight/extra Batteries
(d) Extra radio batteries
(e) Extra clothing
(f) Rain Gear
(g) Sunscreen
(h) Bug repellant
(i) Extra food and water

Weather

(a) Dress in layers to accommodate weather changes.
(b) Check weather forecast prior to shift.
(c) Make sure the weather is not going to impact your ability to complete your flagging responsibilities.

Always conduct inspections on all flagging equipment prior to arriving on the job site (flagging paddles, radios, and signage).

Chapter Two

Flagging Qualifications and Guidelines

2.1 Flagger Attributes

Flaggers are the eyes and ears of a construction site, an integral part of the safety for workers and drivers alike. Flaggers are responsible for the safety of road users, workers, and themselves. The best flaggers are those individuals who possess certain attributes as the ones listed below.

- **Awareness** – Routinely working near traffic can lead to workers becoming complacent to the danger around them. Therefore, it is necessary to continually remind ourselves and those around us of the dangers to which everyone is exposed.
- **Communication -** Flaggers can receive and communicate specific instructions clearly, firmly, and courteously.
- **Alertness** – There is no place in the work zone for unnecessary distractions. Every individual must stay constantly alert and attentive for their own protection and the entire crew.
- **Attitude** – A safety-conscious attitude on the part of each crew member will contribute greatly to the overall safety for all.
- **Responsibility** – It is everyone's responsibility to understand and comply with all safety standards and practices.

2.2 Flagger Qualifications

Must be in good physical condition: As a flagger you will need good hearing as well as vision (with or without the help of glasses or electronic hearing aids). Flaggers need the ability to be mobile enough to maneuver around the flagging station and to escape an errant vehicle if needed during emergency situations. Flagging requires the ability to stand in a full and upright position while controlling the signaling devices providing clear and concise directions to road users.

When **not actively flagging**, flaggers may be expected to assist with the establishment of the traffic control zone elements such as advance warning sign placement, channelizing devices, and taper designs.

2.3 Flagging Guidelines

- You must always carry your flagger certification card while on the job. The Washington State Flagger Certification card is accepted in Washington State, Oregon, Idaho and Montana.

- Stand in a conspicuous place on the shoulder of the road. Never step into the traffic lane.

- Flaggers stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users. A flagger must only stand in the lane being used by moving road users after road users have stopped.

- Stand alone, stand upright, look alert and project your authority and professionalism as a flagger.

- The flagger shall always be clearly visible to the first approaching road user.

- The flagger shall be visible to other road users.

- When choosing the location of a flagger station you shall chose a location that provides you with an escape route.

- The flagger shall be stationed sufficiently in advance of the workspace to warn workers (*with audible warning devices such as horns or whistles*) of approaching danger by out-of-control vehicles.

- Stand where there is a sharp color contrast between you, the background, and the equipment. If possible, never stand in the shade.

- Stand in a manner and location that traffic and the workspace can be observed.

- Remain at your position. Never abandon your flagging station for any reason until you are relieved by your supervisor or a qualified flagger.

- Do not stand in front of stopped or parked vehicles on the road.

- When flagging on a hill or a curve, the flagger station should be installed before the crest of a hill or curve.

- Never leave the FLAGGER AHEAD sign up when the flagger is no longer needed or present. Cover, turn, or remove signs that no longer apply.

- Cover, turn or remove any signs that do not apply when the flagger is no longer actively flagging; or when the shift is done for the day.

- When dealing with an angry motorist, the flagger should remain calm, agree with the driver, and de-escalate the situation.

2.4 Rest Periods

- Flaggers receive a rest period of at least 10 minutes, on the employer's time, for each 4 hours of working time.

- Rest periods must be scheduled as near as possible to the midpoint of the work period.

- A flagger must not be allowed to work more than 3 hours without a rest period.

Exception: *Scheduled rest periods are not required where the nature of the work allows a flagger to take intermittent rest period's equivalent to 10 minutes for each 4 hours worked.*

Chapter Three

Positioning for Safety

3.1 Flagging Station: Stopping Distance

Flagging Station – Refers to the designated area(s) of traffic control flagging operations.

Always stand alone in a highly visible location away from other workers and work vehicles. Flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point.

Table 6E-1 of the MUTCD is listed as the Stopping Sight Distance as a Function of Speed. This table should be referenced when determining the distance that a car will need to stop based on the speed of the road you are working on. In general, before you begin to stop and slow traffic, you will want to designate a point in front of you that if the approaching road user passes the point, you will know it will not have the distance required to come to a complete stop.

Table 6E-1. Stopping Sight Distance as a Function of Speed

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

*posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated stopping speed in mph.

Mark the designated point at which you should begin to stop traffic with a cone, or associate it with a physical existing marker such as a tree, rock, mailbox, streetlight, or some other point of reference.

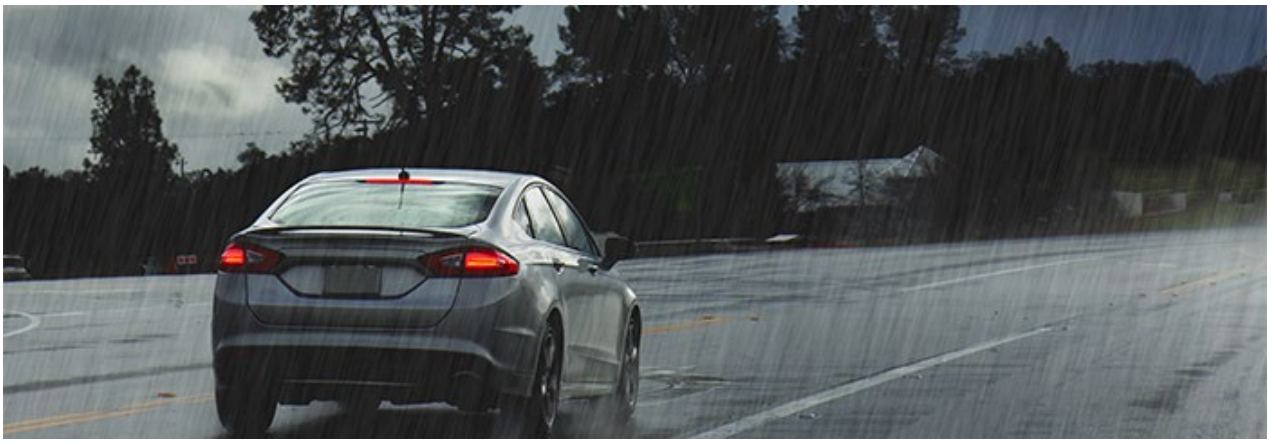
The flagger should identify an escape route that can be used to avoid being struck by an errant vehicle.

Additional circumstances such as weather conditions, vehicle type, road type, and width of the lane travel should be taken into consideration as they play a critical part in how a vehicle can come to a complete stop.

It is important to remember the larger the vehicle, the more distance it will need to come to a complete stop.

The stopping distance point that you designate prior to your shift may need to be adjusted if the pavement is wet instead of dry, if vehicle loads are excessive, or the vehicle type is small and light weight.

The stopping distance is intended to be a minimum guideline and will be dependent upon your judgement as conditions change.



3.2 Flagging Station Locations

Hills

When flagging near a hill, the flagger station should never be placed at the crest of the hill. When choosing a position, the flagger station should be in advance of the hill to ensure that they are visible to the approaching traffic.

Curves

When flagging near curves, always make sure you can be seen by approaching traffic. The flagging station should be well in advance of the curve. Never take a position around a sharp curve.

Elevated Roadways

Directing traffic from an elevated roadway such as a bridge or overpass does not allow for an escape route. While flagging from an elevated roadway is allowed, it is not recommended.

3.3 One-Flagger and Multi-Flagger Operations

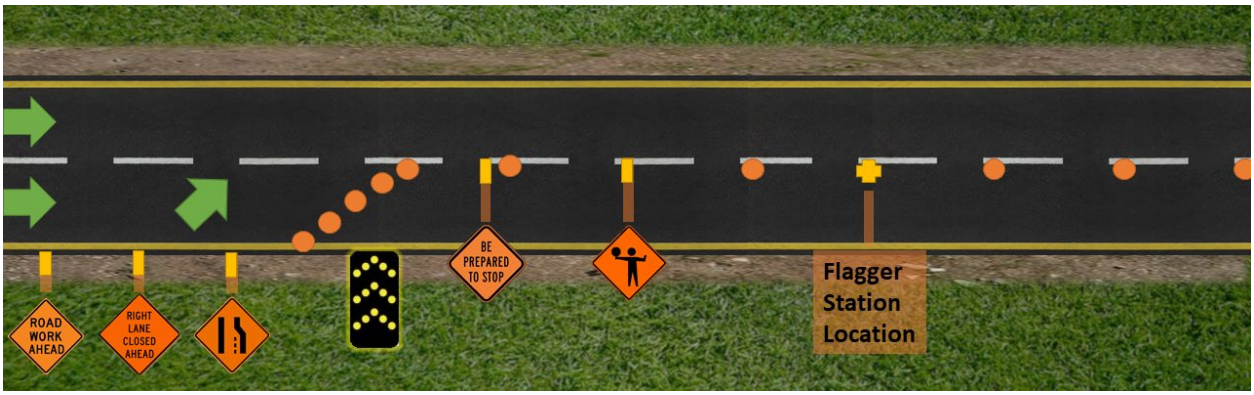
With a short work area on a straight, low volume road, a single flagger can be utilized to control traffic. The flagger must be visible to traffic coming from both directions and should be positioned on the shoulder directly opposite the work area.

A two-flagger operation uses a flagger positioned at each end of the work zone to control the traffic flow. This is the most common flagging operation. One flagger should be designated as the lead flagger for coordinating the operation.

When working on roadways with restricted visibility, or when communication devices fail, a third flagger can be added to the operation to provide communication to the two flaggers. This person will assume the position of lead flagger and will be placed in the middle of the operation to provide visibility and communication to the other flaggers.

3.4 Multi-Lane Flagging Operations

This type of flagging occurs when work vehicles or equipment temporarily need traffic to be stopped in one direction to make a maneuver or to enter/exit the work zone. On multi-lane roads, the lanes shall be closed down to one-single through lane, with the addition of a turn lane if needed. The flagger will control the single open lane from the inside of the closure, only stopping traffic as needed.



This operation should only be performed on highway, rural and urban roadways.

Freeways and expressways have many design features that are unique and flagging on freeways and expressways is prohibited.

Chapter Four

Communicating and Signaling

4.1 Communication

To be an effective, flaggers shall always be able to communicate with one another. Communication can be maintained by:

- **Visual Contact:** This method is effective when flaggers are close enough to see or read each other's STOP/SLOW paddles and to see each other's "ALL CLEAR" signals. It is important to establish with each other before the start of the shift what each signal means to one another, even if the plan is to use radios for the shift, in case of radio failure.

- **Two-Way Radio:** This is the most effective method of communication, even when there is visual contact. Radios should only be used for business purposes, and communications on it should be brief, clear and to the point. It is helpful to carry an extra set(s) of batteries on your persons to maintain constant communication with one another. If there is radio failure and no visual contact, all traffic shall be stopped in all directs until communication is re-established.

- **Flag Carrying:** Also referred to as a baton carry. The driver of the last vehicle in your queue will take a flag, baton or other material to identify to the other flagger that the last vehicle has passed. This is dependent on the driver to take the initiative and stop at the other flagger as they are exiting the traffic control zone. A helpful alternative is to ask the driver permission to affix a ribbon or string to their antenna. You will still give the driver the directions to stop at the other flagger to have the ribbon removed, but in case the driver fails to stop, the other flagger will have a visual indicator of the ribbon to identify the last vehicle.

It is important to remember that you should only release traffic after receiving the "ALL CLEAR" from your partner. When in doubt, STOP all traffic.

4.2 Signaling to Stop

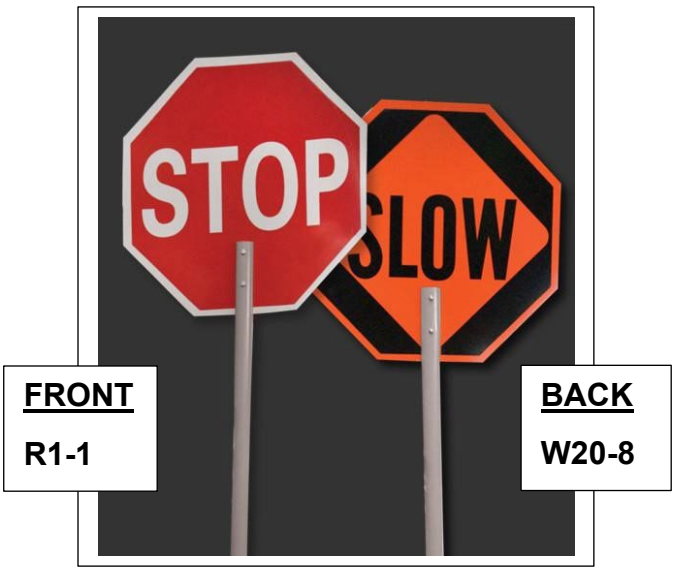
- It is the flagger's responsibility to communicate a clear message to the motorists.

- The paddle and flagger's hand signals are the primary communications method and must be performed with alertness and confidence.

- The 24-inch STOP/SLOW paddle should be considered for hours of darkness and on high speed roads and can be required by some agencies such as WSDOT.

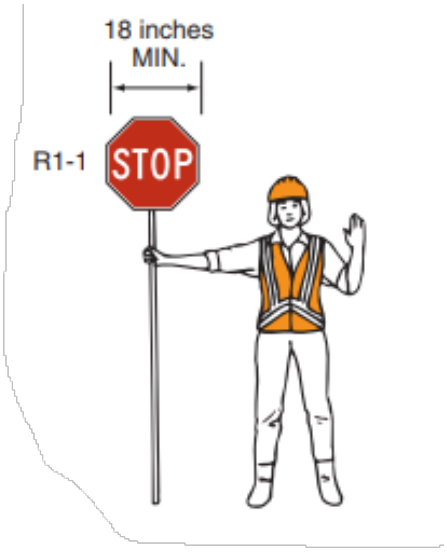
- The STOP/SLOW paddle should be the primary and preferred hand-signaling device. Use of red flags should be limited to emergency situations. The STOP/SLOW paddle shall have an octagonal shape on a rigid handle. STOP/SLOW paddles shall be at least 18 inches wide with letters at least 6 inches high. The STOP (R1-1) face shall have white letters and a white border on a red background. The SLOW (W20-8) face shall have black letters and a black border on an orange background. When used at night the STOP/SLOW paddle shall be retro reflectorized or illuminated.

  Minimum standard flagging paddle size allowed is 18 inches. **A recommendation of a 24-inch paddle be used to improve visibility and for all high-speed operations and is required on all WSDOT projects.**



To STOP road users

The flagger shall face road users and aim the STOP paddle face toward road users in a stationary position with the arm extended horizontally away from the body. The free arm shall be held with the palm of the hand above shoulder level toward approaching traffic.



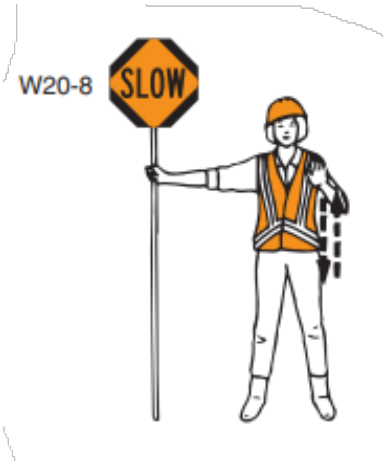
To direct road users to PROCEED

The flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body. The flagger shall motion with the free hand for road users to proceed. (Moving the free hand horizontally left to right.)

To ALERT or SLOW road users

The flagger shall face road users with the SLOW paddle face aimed toward road users in a stationary position with the arm extended horizontally away from the body.

OPTION: To further alert or slow traffic, the flagger holding the slow paddle face toward road users may motion up and down with the free hand, palm down.



- The use of a flashing stop/slow paddle is allowed instead of a standard paddle. Follow the guidance shown in the MUTCD Section 6E.03 for additional information.

- In a mobile operation when the flagger is moving with the operation, all signs associated with the flagger shall be moved ahead whenever work advances to more than **2 miles** from the first advance warning signs. Also, ***a flagger ahead sign must be within 1,500 feet of the flagger*** **and the flagger station must be able to be seen from the sign**. If terrain does not allow a motorist to see the flagger from the "flagger ahead sign", the distance between the sign and the flagger must be shortened to allow visual contact. The spacing shall not be less than the required distance base on the highway speed.

- During hours of darkness, flagger stations shall be illuminated by using a portable light plant or balloon type lights. Mounting height and aim either parallel or perpendicular to the roadway may require adjustment to minimize glare for the road user. **When used, floodlights shall not produce a disabling glare to the road user**. The flagger should be visible and discernable as a flagger from a distance of 1,000 feet.

- Pilot car use is appropriate for long work areas to help maintain traffic speeds and to guide traffic through the work areas. Pilot car operators shall be certified flaggers able to trade off duties with other flaggers. During the pre-activity meeting, discuss any special instructions to ensure everyone understands expectations. Refer to TCP 2 for a pilot car operation.

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

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

- **A four-sign sequence is required for all flagging on roadways with posted speeds of <u>45 mph or higher</u>.** The "one lane road ahead" sign may need to be replaced with a more appropriate sign if flaggers are used for short traffic stops for truck crossing, tree falling, or other work and traffic will not be alternated in a single lane. Possible signs may be:

    - Truck Crossing
    - Road Machinery
    - Utility Work
    - Survey Crew
    - Blasting

Worker symbol sign or simply a sign saying Workers (this sign could be a very generic yet appropriate solution in many cases)

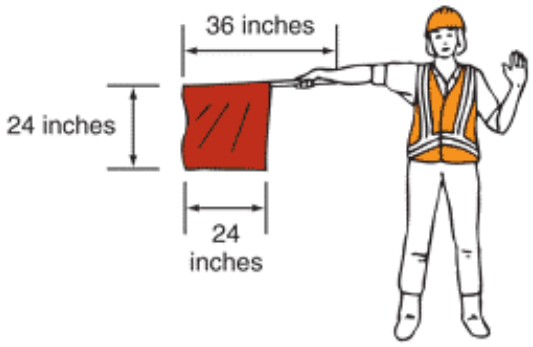
If the above signs are not available or appropriate for the operation, an acceptable alternative would be to repeat the **“Flagger Ahead”** symbol sign or the **“Be Prepared to Stop”** sign. Again, the preferred method is to use the sign that most appropriately describes the roadway condition or work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

4.3 Emergency Situation: Warning Flags

During emergency situations, red flags, meeting the specifications of the MUTCD, may be used to draw a driver's attention to particularly hazardous conditions. In nonemergency situations, a red flag may be held in a flagger's free hand to supplement the use of a sign paddle.

To STOP road users

The flagger shall face road users and extend the flag staff horizontally across the road user's lane in a stationary position, so that the full area of the flag is visible hanging below the staff. The free arm shall be held with the palm of the hand above the shoulder level toward approaching traffic.



To direct road users to PROCEED

The flagger shall stand facing the road users with the flag arm lowered from the view of the road users, and shall motion with the free hand for road users to proceed. Flags shall not be used to signal road users to proceed.

To ALERT or SLOW road users

The flagger shall face road users and slowly wave the flag in a sweeping motion of the extended arm from shoulder level to straight down, without raising the arm above a horizontal position. The flagger shall keep the free hand down.

Flags when used shall be red or fluorescent orange-red in color, retro reflectorized at night, and shall be a minimum of 24 square inches, and shall be securely fastened to a staff that is approximately 36 inches in length. The free edge of a flag should be weighted so the flag will hang vertically, even in heavy winds.

4.4 Emergency Situation: Flashlight with a Red Glow Cone

A flagger may use a flashlight with a red glow cone to supplement the STOP/SLOW paddle or flag at any time.

(a) **To STOP:** When using ONLY a flashlight with a red glow cone in an emergency situation to inform road users to STOP, the flagger shall hold the flashlight with the left arm extended and pointed down toward the ground, and then shall slowly wave the flashlight in front of the body in a slow arc from left to right such that the arc reaches no farther than 45 degrees from vertical.

(b) **To PROCEED:** When using ONLY a flashlight with a red glow cone in an emergency situation to inform road users to PROCEED, the flagger shall point the flashlight at the vehicles bumper, slowly aim the flashlight toward the open

lane, then hold the flashlight in that position. The flagger shall not wave the flashlight.

(c) **To ALERT/SLOW:** When using ONLY a flashlight with a red glow cone in an emergency situation to inform road users to ALERT/SLOW, the flagger shall point the flashlight toward the oncoming traffic and quickly wave the flashlight in a figure eight motion.

Chapter Five

Traffic Control Devices and Equipment

5.1 Vehicles

- **Work Vehicle** – All work vehicles within the work zone must be equipped with an approved flashing warning beacon with 360-degree visibility. 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.

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

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

5.2 Equipment Movement

Road construction routinely involves work within close proximity of construction vehicles and motor vehicle traffic. Flaggers and other workers on foot are exposed to the risk of being struck by traffic vehicles or construction equipment if they are not visible to motorists or equipment operators. Workers who operate construction vehicles or equipment risk injury due to collision, overturn, or being caught in running equipment.

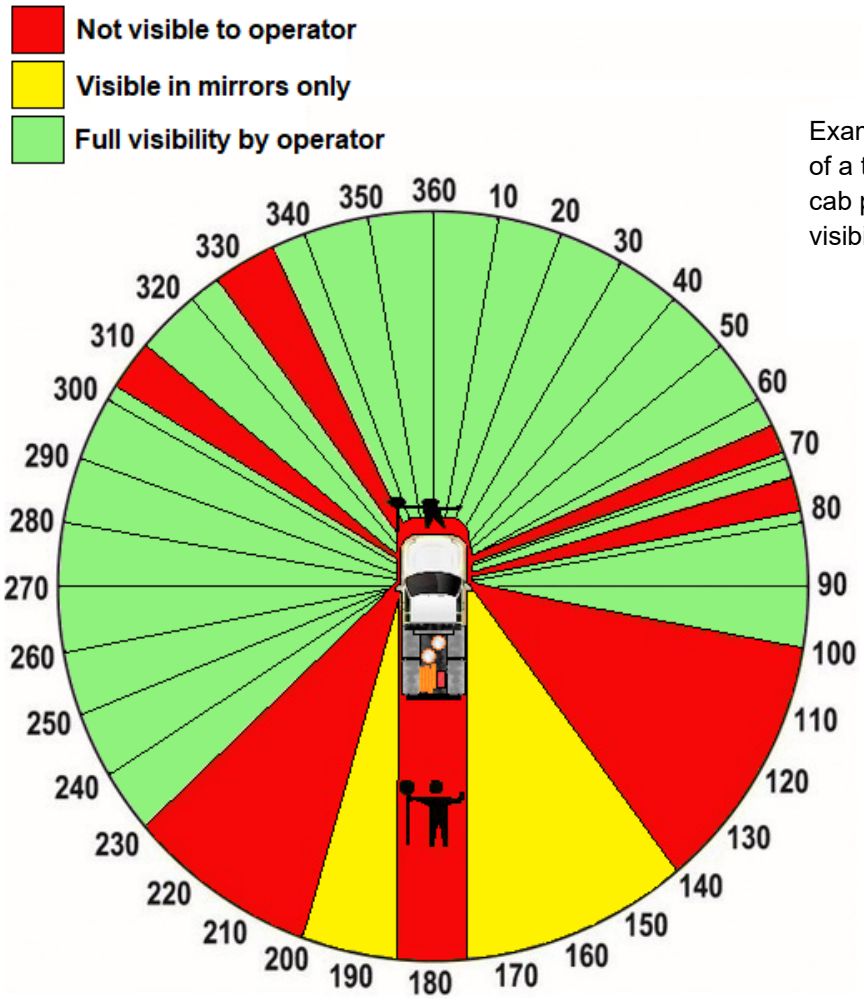
Equipment Movement Safety Guidelines

- If manually guiding the movement of equipment, ensure you make eye contact and acknowledge the operator can always visibly see you and maintain communication with the driver.
- During the movement of equipment, the manually guiding personnel must be able to see the entire backing zone of vehicles.
- Alert personnel of equipment and to clear the path for the equipment's movement.
- Continuously provide direction to the driver until the operator reaches the destination.

The National Institute for Occupational Safety and Health (NIOSH) website contains similar diagrams of several construction vehicles and their associated blind areas.

CDC/NIOSH Website: NIOSH Construction Equipment Visibility Diagrams

Vehicle Blind Spot Diagram



Example shown is of a typical closed cab pickup truck visibility diagram

5.3 Emergency Planning

- Always have an escape plan. Do not have any type of barrier, guardrail, parked vehicles etc. between you and your escape route.

- When leaving the station, drop the flagging paddle in the roadway, then exit at 90 degrees to the path of the oncoming vehicle.

- Devise an audible signal (such as a whistle or horn) which can be heard above the noise of work machinery. **BE ALERT AT ALL TIMES** always keep your mind on your flagging duties.

5.4 Condition of Devices

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

5.5 Traffic Signs

Traffic Signs including those used in road construction and maintenance zones, fall into three categories.

Regulatory - enforce legal requirements

Examples:

Warning - alert drivers to specific hazards

Examples:

Guide - gives motorists information. In the work zone they typically include detour route information.

Examples:

<u>Additional Signs</u>

- Advisory Speed Plaque
- Road Work Ahead or Utility Work Ahead
- Workers Signs
- Motorized Traffic Signs
- Motorcycle Plaque

Temporary Signs

Temporary signs shall be mounted on portable supports which are designed to yield on impact. The bottom of the signs **must be at least one foot above the traveled way.**

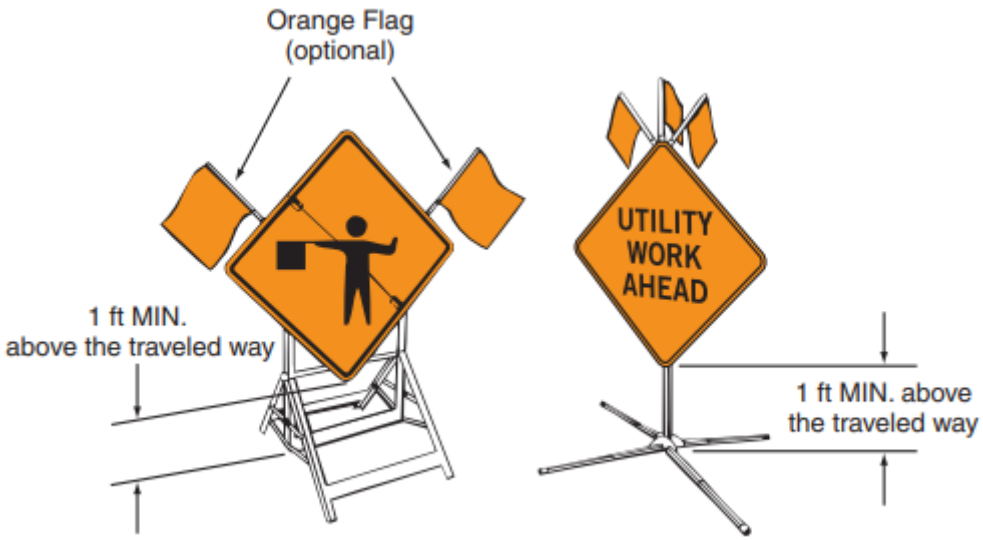
WSDOT requires 48X48 inch warning signs on most plans.

Signs are generally placed on the right-hand side of the road.

Where special emphasis is needed, warning signs may be placed opposite each other, on both the right-hand and left-hand sides of multi-lane roadways.

All portable signage used in Washington State must meet crash standards that utilize break-away construction.

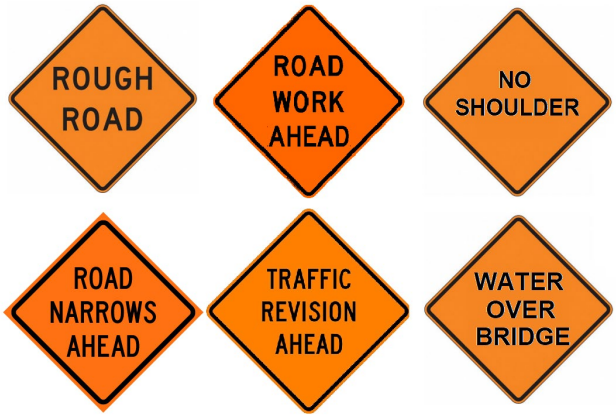
For more information on temporary signs reference MUTCD Chapter 6F Warning Signs and Object Markers. Additional information that is Washington State specifics can be found *Per WAC 296-155-305* .



Temporary Sign Examples:

- Rough Road
- Road Work Ahead
- No Shoulder
- Road Narrows Ahead
- Traffic Revision Ahead
- Water Over Roadway

Examples:



5.6 Portable Changeable Message Signs (PCMS)

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

When locating a PCMS in the field:

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

Example:
Portable
Changeable
Message Sign

5.7 Arrow Boards

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

Figure 6F-6. Advance Warning Arrow Board Display Specifications

Operating Mode	Display (Type C arrow board illustrated) (right arrow shown; left is similar)
1. At least one of the three following modes shall be provided:	
Flashing Arrow	 Merge Right
Sequential Arrow	 Merge Right
Sequential Chevron	 Merge Right
2. The following mode shall be provided: Flashing Double Arrow	 Merge Right or Left
3. At least one of the following modes shall be provided: Flashing Caution or Alternating Diamond Caution	 Flashing Caution or Flashing Caution or Alternating Diamond Caution

Arrow Board Type	Minimum Size	Minimum Legibility Distance	Minimum Number of Elements
A	48 x 24 inches	1/2 mile	12
B	60 x 30 inches	3/4 mile	13
C	96 x 48 inches	1 mile	15
D	None*	1/2 mile	12

*Length of arrow equals 48 inches, width of arrowhead equals 24 inches

NOTE:

Only caution mode is the Four Corners Flashing Caution per WSDOT specifications.

5.8 Channelization Devices

When construction or maintenance activities block a portion of a roadway, road users must be rerouted and/or channelized.

Channelizing devices provide for smooth and gradual vehicular traffic flow from one lane to another.

1. Traffic safety cones are the most common devices used to separate and guide traffic in a work zone. The minimum cone size is 18 inches tall. **For speeds of 45 mph or higher, or during nighttime operations, cones must be a minimum of 28 inches tall, and have retro- reflective bands.**
2. Tubular markers having a uniform diameter and at any height, should only

be used where space restrictions do not allow for other more dominate devices. Tubular markers may be used to divide opposing traffic lanes, divide open lanes in the same direction on low speed roads and to delineate the edge of a pavement drop off.

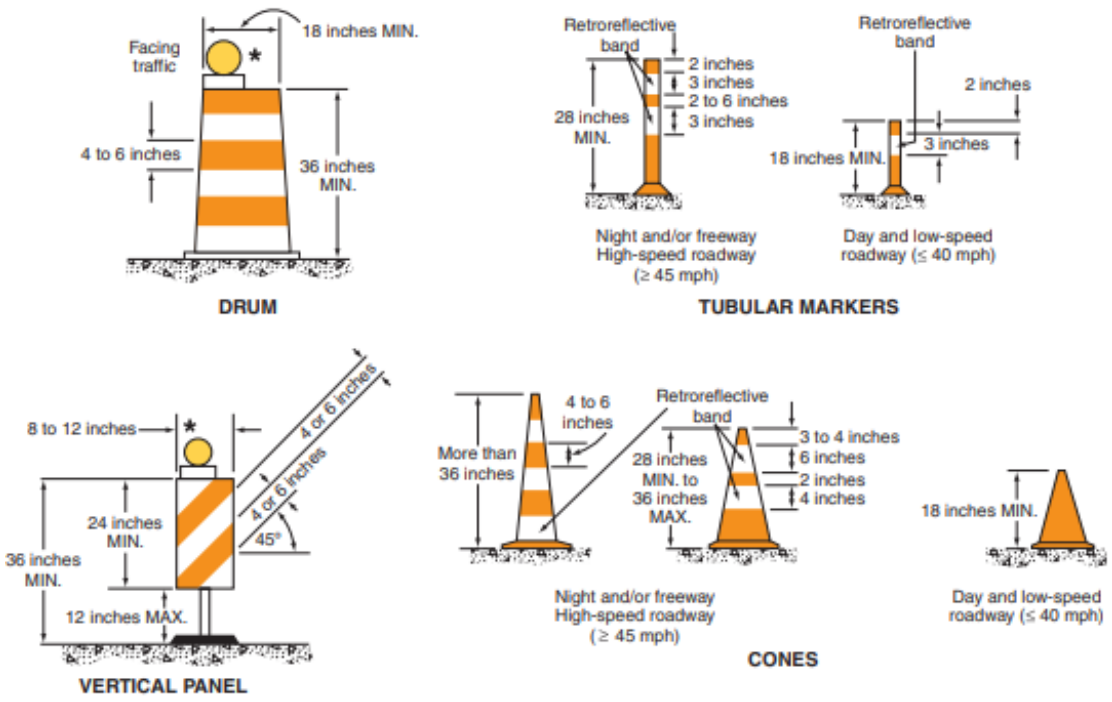
3. Tall Channelizing devices are a minimum of 42 inches tall, using a tapered cone type shape and are a good option for use on high speed roadways in lieu of 28-inch cones due to their greater visibility.
4. Traffic safety drums shall be a minimum 36 inches tall and are the most dominant and preferred device for high-speed high-volume highways because they have the greatest visibility. Drums shall have horizontal and circumferential retroreflective banding around the drum for visibility.
5. Vertical flat panel devices and devices with directional stripe patterns are not allowed due to frequency of placement errors.
6. Traffic Safety Drums or Tall Channelization Devices are required for lane closure tapers on multi-lane highways with posted speeds of 45 mph or greater. If Tall Channelization Devices are used, using half the maximum spacing to increase the taper visibility is required. Region Traffic Engineer approval is required to use cones for this condition.
7. Maximum device spacing requirements are shown on the TCPs.
8. All channelization devices shall be made of lightweight, crashworthy materials meeting the standards set at a minimum of the NCHRP 350 standards, and with a preference to devices meeting the MASH 2016 testing standards.

Washington State Channelizing Device Spacing Chart

MPH	Taper*	Tangent
50/70	40	80
35/45	30	60
25/30	20	40

*One-lane, two-way traffic and downstream tapers shall have 20 foot device spacing at any speed limit.

NOTE: These distances are maximum

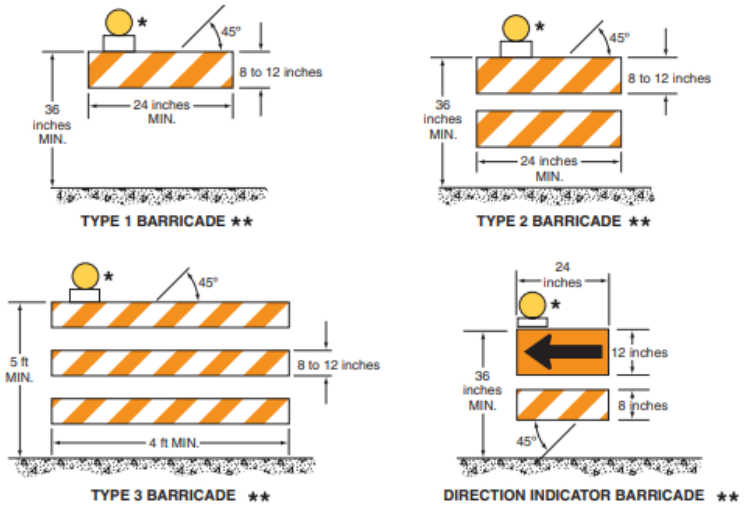


5.9 Barricades

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

1. **Type 1 Barricade** – Used on lower speed roads and streets to mark a specific hazard or can be used for sidewalk closures as appropriate.
2. **Type 2 Barricade** – Used on higher speed roadways and has more reflective area for nighttime use to mark a specific hazard.
3. **Type 3 Barricade** – Used for road closures.

Signs mounted on Type 3 Barricades shall be per the manufacturer's recommendations or per Standard Plan K-80.20



* Warning lights (optional)
** Rail stripe widths shall be 6 inches, except that 4-inch wide stripes may be used if rail lengths are less than 36 inches. The sides of barricades facing traffic shall have retroreflective rail faces.

Striping - The 2009 Edition of the Manual on Uniform Traffic Control Devices (MUTCD) discusses Type III Barricades under Section 6F.68. The MUTCD states that Type III Barricades should be used to close or partially close a road. The stripes on barricade rails shall be alternating orange and white retro reflective stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Barricades used on freeways, expressways, and other high-speed roadways shall have a minimum of 270 square inches of retro reflective area facing road users.

One-Way Turn Barricades - Where barricades extend entirely across a roadway, the stripes should slope downward in the direction toward which road users must turn.

Example:

This barricade closure indicates road users must turn left.

Right and Left Turn Barricades - When providing both right and left turns, the barricade stripes should slope downward in both directions from the center of the barricade or barricades.

Example:

This barricade closure indicates road users may turn right or left.

No Turn Barricades - Where no turns are intended, the stripes should be positioned to slope downward toward the center of the barricade or barricades.

Example:

This barricade closure indicates no turns are intended.

Signs on Barricades - The MUTCD, under Section 6F.03, allows for installation of signs on barricades. Section 6F.03 states that signs mounted on barricades and barricade/sign combinations shall be crashworthy. Signs mounted on Type III barricades should not cover more than 50 percent of the top two rails or 33 percent of the total area of the three rails.

Signs Mounted Separately Behind Barricades - The most common method of using signs with barricades is to mount the sign on a crashworthy device and place the unit behind the barricade. One advantage of this system is that both the barricade and the manner in which the sign is mounted are both crashworthy. Another advantage is that the barricade does not become top-heavy and tip over in high wind areas. Also, the adjustment of the sign height is easy for use in rural areas and urban and interstate highway areas.

5.10 Positive Protection Devices

Temporary Barrier are mostly constructed of concrete. Steel barriers are also becoming more available, some with castors allowing greater portability and barrier openings for work area access. Temporary barriers are recommended for long-term, stationary work zones.

Consider the following for use of temporary barriers:

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

Example: Concrete Temporary Barrier

Example:

Steel Temporary Barrier

5.11 Truck Mounted Attenuators

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

The TMA is used as a shield to prevent errant vehicles from entering the work area. During use, the attenuator shall be in the fully deployed position. For stationary operation, the parking brake shall be set, and the tires aligned straight as per manufacturer's direction. A roll ahead distance is required between the TMA and the work area based on the host vehicles weight and the traffic speed. Roll ahead distance is a clear zone that should never have anything or anyone within it.

Considerations for the use of TMAs:

1. TMA use is always recommended but may be required on freeway or high-speed high-volume highway work areas.
2. Operations requiring personnel in the work zone on foot or lift-bucket truck operations, a TMAs should be strongly considered.
3. See the plans and details for TMA placement and roll ahead distance requirements.

Highlighted Example: TMA attached behind a Traffic Control Placement Vehicle.

5.12 Warning Lights

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

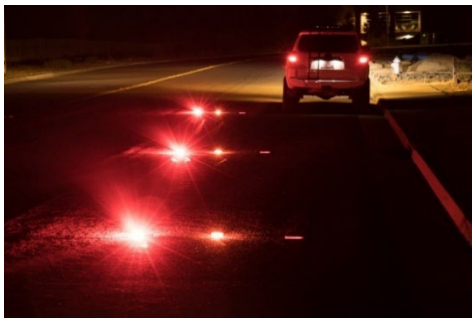
There are four types of warning lights:

1. **Type A** (low-intensity flashing)
2. **Type B** (high-intensity flashing)
3. **Type C** (steady burn)
4. **Type D** (360 degree steady burn)

5.13 Flares

All work vehicles should carry a supply of flares. Use flares only to alert drivers to emergencies.

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



Examples:
Electronic
Road Flare

5.14 Portable Signal Systems

Portable traffic control signals are trailer mounted traffic signals used in work zones to control traffic instead of using an actual flagger. The maximum distance between signal heads is 1,500 feet to minimize wait time and clearance interval. These versatile, portable units allow for alternative power sources such as solar power, generator, and deep cycle marine batteries in addition to AC power. Portable signals are typically used in work zones to control traffic such as temporary one-way operations along a two-lane, two-way highway where one lane is closed, and alternating traffic movements are necessary.

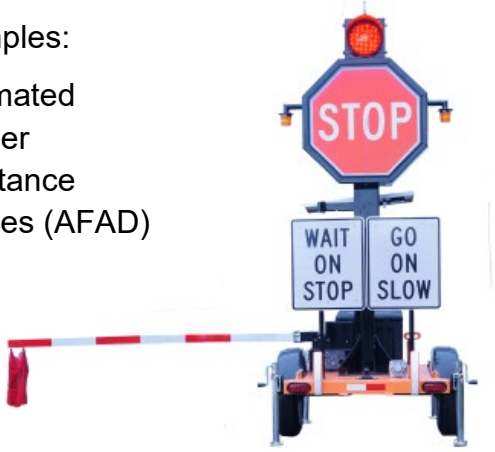
Example: Portable Traffic Control Signal

5.15 Automated Flagger Assistance Device (AFAD)

An AFAD is used instead of a paddle to control the movements of traffic and operated remotely by a flagger located off the roadway and away from traffic increasing flagger safety. Because an AFAD cannot be programmed, it shall not be used as a substitute for a replacement of a continuously operating temporary traffic control signal. When sight distance to the flagging station and/or flagger escape routes will be limited, consider using and AFAD. A pilot car operation is still recommended for longer work areas. See TCP 18. Additional information is available in the MUTCD Section 6E.

Examples:

Automated Flagger Assistance Devices (AFAD)



5.16 Portable Highway Advisory Radio (HAR)

A portable trailer mounted roadside radio broadcast system that can provide detailed work zone traffic and traveler related information via AM radio. WSDOT HAR systems may be available when working on State Highways.

Chapter Six

Temporary Traffic Control Zone

6.1 Temporary Traffic Control Zone

Temporary Traffic Control Zone—an area of a highway where road user conditions are changed because of a work zone or incident by the use of temporary traffic control devices, flaggers, uniformed law enforcement officers, or other authorized personnel.

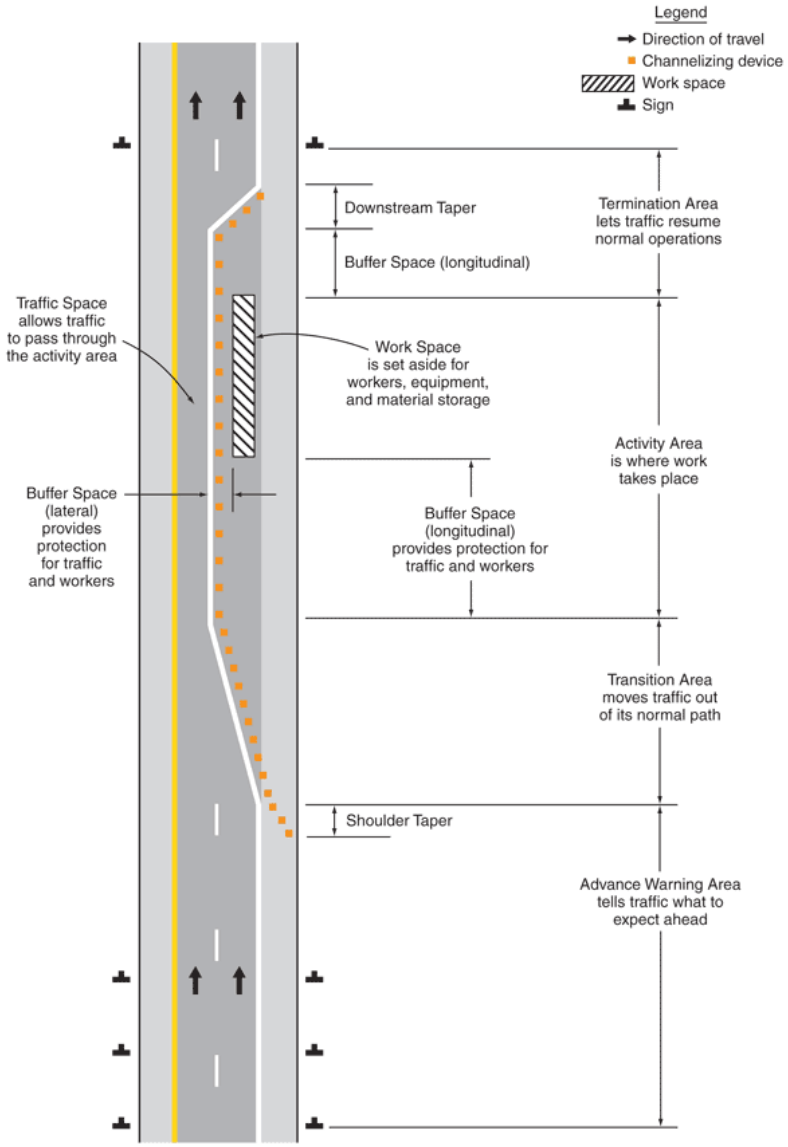
The temporary traffic control setup is designed to:

1. Tell the road user that work on or near the roadway is being performed.
2. Let the road user know what they need to be prepared for as they approach the work area.
3. Tell the road user what actions they need to perform, including being prepared to stop, change lanes, or follow detour routes.
4. Installed correctly, they should give the driver plenty of time and distance to perform the action necessary.
5. Provide enough buffer space in advance of the work crew, so that a driver not following the advanced warning directions has enough distance to stop their vehicle.
6. Provide clear boundary next to the work area the road user can identify.
7. Provide bicyclists, pedestrians, including those with disabilities, safe passage through the temporary traffic control zone.
8. Provide adequate space for work activities to be performed.

The temporary traffic control zone is comprised of four areas.

Each area serves a specific function in the channelization of vehicles through and around the work zone.

Figure 6C-1. Component Parts of a Temporary Traffic Control Zone



1. **Advance Warning Area**
2. **Transition Area**
3. **Activity Area**
4. **Termination Area**

6.2 Installation and Removal

The installation and removal of temporary traffic control creates a situation which is often more hazardous than the operation of the completed zone. The workers placing and retrieving the signs and channelization devices must be on the roadway which is open to traffic.

Additionally, the placement operation is a more unexpected situation for the driver than the actual work zone itself. To minimize these hazards, it's essential that the installation proceed in an organized manner and be accomplished as quickly as possible. Prior to the beginning of any operation and before any crewmember is exposed to live traffic, the crew will discuss the daily pre-activity safety plan relative to the planned activity.

Installation and removal shall be done in a manner which cause the least risk to traffic and provides for the safety and protection of the workers involved.

Devices shall be installed in the direction that traffic is moving, this is referred to as "downstream".

The first device placed is the first advanced warning sign, which is typically the "Road Work Ahead" sign or symbol. The installation then proceeds downstream with the remaining advanced warning signs, then the transition area, and finally the termination area.

The vehicle being used to haul the devices shall be highly visible with at least rotating beacons or strobe lights. Shadow vehicles used for the establishment of the temporary traffic control zone are recommended for additional safety, and if possible utilizing a TMA.

When possible, the temporary traffic control devices shall be removed in the reverse order of installation. This requires the crew to move "upstream" or against traffic through the work zone. If using a vehicle to pick up devices, the vehicle must have its headlights, beacons, and/or strobes on.

6.3 Advanced Warning Area

This is the section of the temporary traffic control zone where motorists are informed about the upcoming work zone and what to expect. This area will be where you place the advanced warning signs such as "Road Work Ahead", "One Lane Road Ahead", and

“Flagger Ahead”. The signs used on roadways provide three types of information: **regulatory, warning and guide**.

1. In a work zone environment, **regulatory** signs typically inform road users of traffic laws such as speed limits, lane assignments, or directions such as “Yield”. These signs are typically black letters or symbols on white backgrounds. These signs may be included throughout the temporary traffic control zone as needed per approved traffic control plans.

2. **Warning** signs are used when it is necessary to advise road users of unexpected conditions. Work zone examples include “Road Work Ahead”, “Flagger Ahead”, and “Be Prepared to Stop”.

3. **Guide** signs are used to provide information that helps the road user find their way. In the work zone the typically include detour route information.

Signs are generally installed on the right hand side of the road. Where special emphasis is needed, warning signs may be placed on both the right and left hand side of the road. When placed on portable sign stands, the bottom of the sign must be at least one foot above the traveled roadway. In areas with high wind, sand bags, also known as ballast, can be used, they cannot be any taller than 4 inches above the traveled roadway and shall not interfere with the breakaway features of the device per the Washington State Standard Specifications 1-10.3(3)D .

Sign size can vary; they are typically going to be 36’’x36’’ on city streets, country roads and low speed operations. On all WSDOT projects, or on roadways with a speed limit of 45 mph or greater, signs will be 48’’x48’’. They can be supplemented with warning lights, warning flags and the distances between the signs can be increased to accommodate visibility concerns. All signs and supports shall be crashworthy.

All signs used during the hours of darkness must be illuminated and made of retroreflective material so the sign looks the same in both daylight and darkness.

Per WAC 296-155-305(8) Advance warning signs.

1. Employers must provide the following on all flagging operations:
   - A three sign advance warning sequence on all roadways with a speed limit below 45 mph.
   - A four sign advance warning sequence on all roadways with a 45 mph or higher speed limit.

2. Warning signs must reflect the actual condition of the work zone. When not in use, warning signs must be either be taken down or covered.

3. Employers must make sure to follow Table 1 for spacing of advance warning sign placement.

Warning Sign Placement *(Per WAC 296-155-305(8)*

Road Type	Speed	Distances between Advanced Warning Signs*			
		A**	B**	C**	D**
Freeways and Expressways	70 55	1,500 ft +/- or per the MUTCD	1,500 ft +/- or per the MUTCD	1,500 ft +/- or per the MUTCD	1,500 ft +/- or per the MUTCD
Rural Highways	65 60	800 ft. +/-	800 ft. +/-	800 ft. +/-	800 ft. +/-
Rural Roads	55 45	500 ft. +/-	500 ft. +/-	500 ft. +/-	500 ft. +/-
Rural Roads and Urban Arterials	40 35	350 ft. +/-	350 ft. +/-	350 ft. +/-	
Rural Roads, Urban Streets, Residential Business Districts	30 25	200 ft. +/-***	200 ft. +/-***	200 ft. +/-***	
Urban Streets	25 or less	100 ft. ***	100 ft. ***	100 ft. ***	

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

** This refers to the distance between advance warning signs.

*** This spacing may be reduced in urban areas to fit roadway conditions

The distance from the first sign to the start of the transition area should be long enough to give motorists adequate time to respond to the conditions.

Flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point.

The distances shown in Table 6E-1, which provides information regarding the stopping sight distance as a function of speed, may be used for the location of a flagger station. These distances may be increased for downgrades and other conditions that affect stopping distance.

Table 6E-1. Stopping Sight Distance as a Function of Speed

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed

Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space. The flagger should identify an escape route that can be used to avoid being struck by an errant vehicle.

6.4 Work Zone Speed Limits

The speed limits on state highways are set by the State Traffic Engineer and cannot be changed without approval. Roadway surface issues such as loose gravel from chip seal operations, temporary width restrictions or lane shifts, application of a temporary traffic signal are some examples of when a speed limit may need to be reduced. Speed reduction guidelines and requests are outlined in RCW 47.48.020.

6.5 Buffer Space

1. **Buffer space** - A lateral and/or longitudinal area that separates traffic flow from the workspace providing some recovery space for an errant vehicle.
2. **Lateral buffer** - The space between an open lane of traffic and the adjacent work area, temporary barrier, work vehicle, protective vehicle, shadow vehicle or drop-off. A minimum of 2-foot lateral buffer space or more may be recommended.
3. **Longitudinal buffer** - The space from the end of the taper to the protective vehicle.

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

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

6.6 Tapers

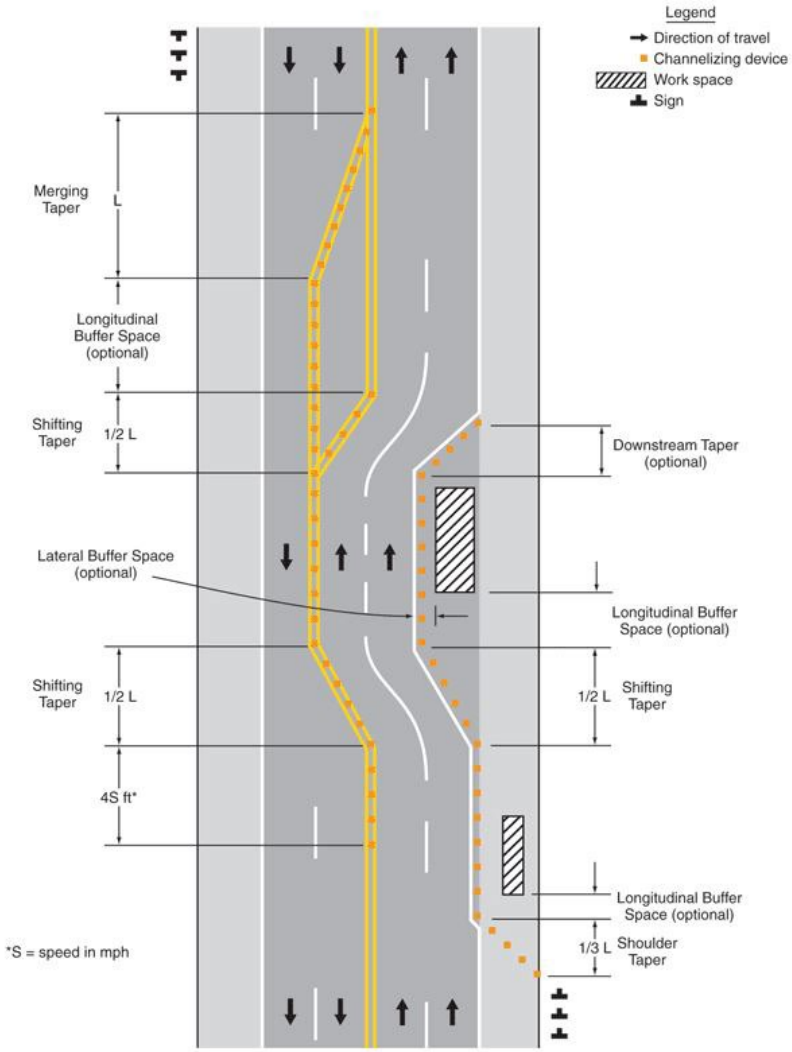
Tapers may be used in both the transition and termination areas.

Whenever tapers are to be used in close proximity to an interchange ramp, crossroads, curves, or other influencing factors, the location of the tapers may be adjusted.

Tapers are created by using a series of channelizing devices and/or pavement markings to move traffic out of or into the normal path.

Types of tapers are shown in Figure 6C-2.

Figure 6C-2. Types of Tapers and Buffer Spaces



If a longitudinal buffer space is used, the values shown in Table 6C-2 may be used to determine the length of the longitudinal buffer space.

Table 6C-2. Stopping Sight Distance as a Function of Speed

Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
55 mph	495 feet
60 mph	570 feet
65 mph	645 feet
70 mph	730 feet
75 mph	820 feet

** Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed*

Typically, the buffer space is formed as a traffic island and defined by channelizing devices.

When a shadow vehicle, arrow board, or changeable message sign is placed in a closed lane in advance of a workspace, only the area upstream of the vehicle, arrow board, or changeable message sign constitutes the buffer space.

A **Lateral Buffer Space** may be used to separate traffic space from the workspace, or a potentially hazardous area. Such as an excavation or pavement drop off. It may also be used between two travel lanes, especially those carrying opposing traffic. The width of the lateral buffer spaces is based on engineering judgement. If used, a minimum of two feet is recommended for the lateral buffer space.

Merging Taper = L minimum

Used to move traffic laterally from its normal lane to merge with an adjacent lane of traffic. A merging taper requires the longest distance because

drivers are required to merge into common road space. A merging taper should be long enough to enable merging drivers to have adequate advance warning and sufficient length to adjust their speeds and merge into a single lane before the end of the transition. Following is a table of merging taper lengths (L) and the maximum spacing of channelizing devices for various speeds and widths of closing.

Shifting Taper = 1/2 L minimum

Used when traffic is moved laterally into a different travel path but the number of through lanes is not reduced. A shifting taper is used when a lateral shift is needed. A shifting taper should have a length of ½ L.

Shoulder Taper = 1/3 L Minimum

Used when work activities on an improved shoulder require the temporary closure of the shoulder. A shoulder taper may be beneficial on a high-speed roadway where shoulders are part of the activity area and are closed, or when improved shoulders might be mistaken as a driving lane. Shoulder tapers should have a length of at least 1/3 L. If a shoulder is used as a travel lane, either through practice or during a temporary traffic control activity, a normal merging or shifting taper should be used.

Downstream Taper –

A downstream taper should have a length of 50 to 100 feet per lane with 6 devices placed at a maximum spacing of 20 feet.

One-Lane, Two-Way Taper = 50’ to 100’

Also known as a flagger taper, used to guide traffic into the open lane when the flagger directs traffic to proceed. This taper length is not calculated, it will be the same length regardless of the speed limit. A one-lane, two-way taper is used in advance of an activity area that occupies part of a two-way roadway in such a way that a portion of the road is used alternately by traffic in each direction. A one-lane, two-way taper is denoted by “50 to 100 feet” on traffic control plans. This taper is used for flagging operations only, and shall include a minimum of 6 channelization devices separated at approximately 20-foot spacing.

TAPER/CHANNELIZING DEVICE TABLE

MERGING, SHIFTING & SHOULDER TAPER LENGTHS

AND NUMBER OF CHANNELIZATION DEVICES USED

Lane Width	10 feet				11 feet				12 feet				Shoulder Tapers (Assumes 10' Shoulders)		
	L		1/2L		L		1/2L		L		1/2L		*1/3L		
MPH	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	MPH	(ft) Length	Devices
20	70	5	35	3	75	5	40	3	80	5	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*

Finding "L"												
	OFFSET/LANE WIDTH or SHOULDER WIDTH											
SPEED MPH		2	3	4	5	6	7	8	9	10	11	12
	20	15	20	30	35	40	50	55	60	70	75	80
	25	25	35	45	55	65	75	85	95	105	115	125
	30	30	45	60	75	90	105	120	135	150	165	180
	35	45	65	85	105	125	145	165	185	205	225	245
	40	55	80	110	135	160	190	215	240	270	295	320
	45	90	135	180	225	270	315	360	405	450	495	540
	50	100	150	200	250	300	350	400	450	500	550	600
	55	110	165	220	275	330	385	440	495	550	605	660
	60	120	180	240	300	360	420	480	540	600	660	720
	65	130	195	260	325	390	455	520	585	650	715	780
	70	140	210	280	350	420	490	560	630	700	770	840

The following charts break up the length of the taper, and the channelization device spacing needs.

Device Spacing Chart

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

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

****** Termination taper, when used should be between 50 to 100 ft per lane with devices placed approximately 20 ft O.C.

Taper Length Formula

Posted Speed	Formula
40 mph or under	$L=WS^2/60$
45 mph or over	L=WS

Where: L= taper length in feet; W= width of lane or offset in feet; and S = posted speed, off-peak 85^{th} percentile speed in mph.

6.7 Activity Area

This is the section of the roadway where work is being conducted. The activity area is comprised of three sections:

1. Buffer Space: Lateral and longitudinal spaces that separate the road user from the workers, pavement edge drops, or excavations. No workers, equipment, vehicle(s), or materials should be stored or positioned within the buffer area. The buffer space is an optional feature that should be included in the temporary traffic control zone if the site allows for it. Because stopping distances vary based on speed, Table 6E-1 should be referenced for the optimal distance to provide for the buffer space.

2. Work Space: The area where workers and equipment occupy the roadway. The work area may be stationary or may move as work progresses.

3. Traffic Space: The part of the road traveled by the road user to get through the activity area.

6.8 Termination Area

This is the area of the roadway where the road users return to their normal path of travel. The termination area extends from the end of the activity area to the last temporary traffic control devices, such as an “End of Road Work” sign, or a downstream taper.

6.9 Work Zones

Work zones are divided into traffic spaces where motorists are allowed to travel, and work spaces where workers are performing their work activities. Keeping workspaces and traffic spaces separate in work zones allows both the motoring public and workers to be as safe as possible.

Work spaces and traffic spaces are separated in two ways:

- By using traffic barriers and other positive protection devices that restrict:
    1. Vehicles from entering the work space.
    2. Workers from accidentally walking or moving their equipment into the traffic space.
- By increasing the distance between the two spaces so that motorists or workers who stray out of their respective spaces can recover and return to the proper space.

The choice of which method to use (or whether to use both methods together) depends on many factors, such as:

- The width of the roadway
- The expected traffic demand through the work zone
- The expected duration of the work zone
- The temporary traffic control method used
- The Speed that traffic is moving at the site

Although both methods reduce risks of injury and death, they cannot completely eliminate risk. Work zone designers and workers must understand the risks associated with each method.

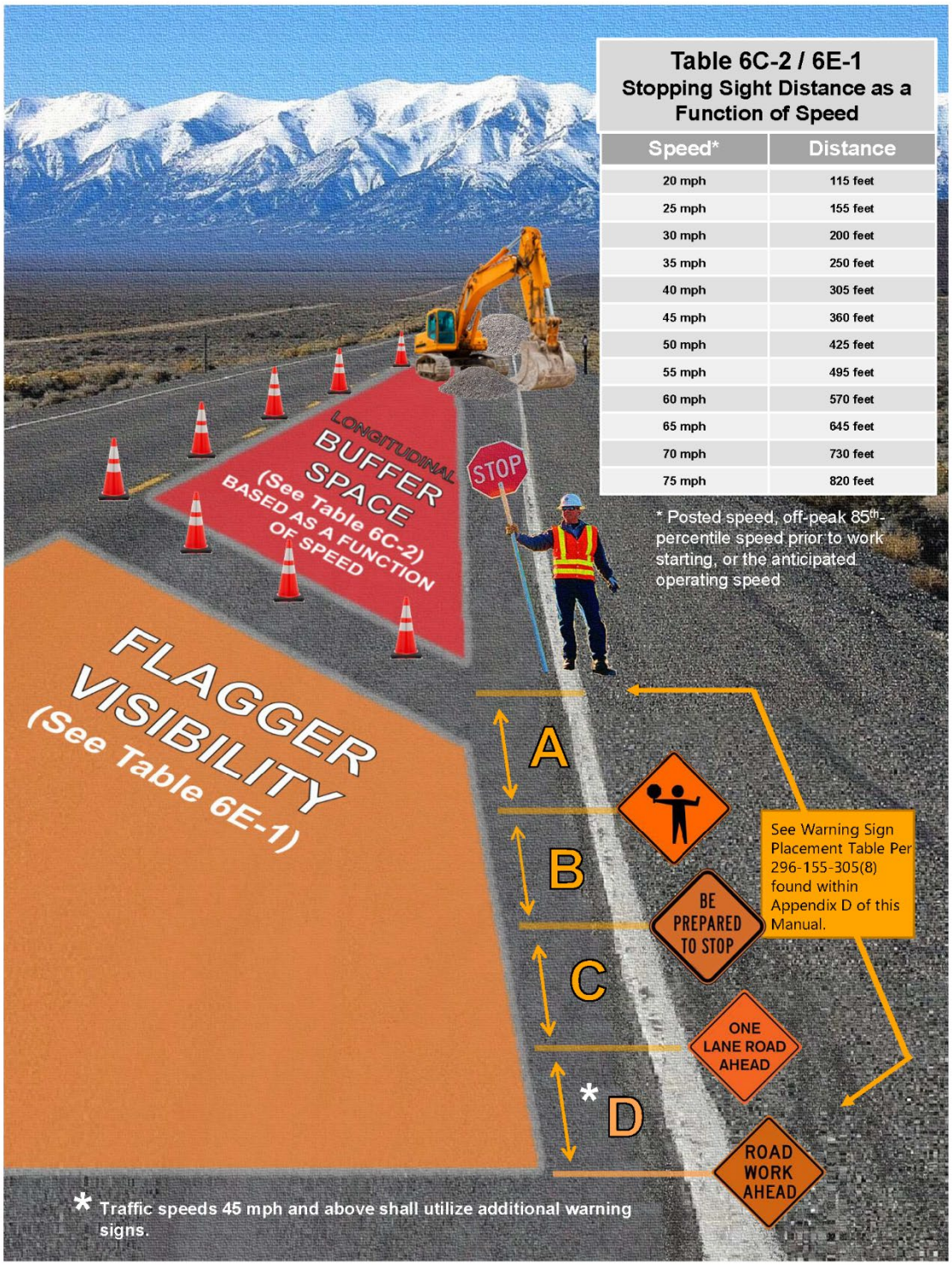


Table 6C-2 / 6E-1
Stopping Sight Distance as a Function of Speed
Speed* | Distance
20 mph | 115 feet
25 mph | 155 feet
30 mph | 200 feet
35 mph | 250 feet
40 mph | 305 feet
45 mph | 360 feet
50 mph | 425 feet
55 mph | 495 feet
60 mph | 570 feet
65 mph | 645 feet
70 mph | 730 feet
75 mph | 820 feet
* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed
LONGITUDINAL BUFFER SPACE (See Table 6C-2) BASED AS A FUNCTION OF SPEED
STOP
FLAGGER VISIBILITY (See Table 6E-1)
A
B
C
* D
BE PREPARED TO STOP
ONE LANE ROAD AHEAD
ROAD WORK AHEAD
See Warning Sign Placement Table Per 296-155-305(8) found within Appendix D of this Manual.
* Traffic speeds 45 mph and above shall utilize additional warning signs.

6.10 Pedestrians, Bicyclists, and Other Roadway Users

Consideration shall be given to pedestrian and bicycle traffic where appropriate. Provide an alternate route when existing facilities must be temporarily interrupted due to work operations. Alternative routes need to be clearly delineated and separated from the work activities. Refer to MUTCD Chapter 6D for additional requirements and TCD 10 of this manual for a typical plan for pedestrian traffic control.

Pedestrians

- **All pre-existing ADA compliant pedestrian facilities within the work zone must continue to comply with ADA requirements for access during work operations.** Consider the following when addressing pedestrian issues within and around work zones:

- Pedestrian accessibility through or around the work area must be accounted for prior to starting work. If temporary pedestrian ramps are necessary, see the Plan Sheet Library under the Standard Plans site.

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

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

- Do not place signs and other traffic control devices within the pathway.

For Sidewalk closures, advance closure/direction signs are required at the nearest upstream crossing to minimize pedestrian's need to retrace their steps.

Bicyclists

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

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

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

4. 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.

Motorcyclists

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

1. Student path to and from the school.
2. Parent drop off and pickup access.
3. Bus movements for loading and unloading students.
4. Coordination with crossing guards.
5. School hours to minimize impacts.

Grade Crossings

When a grade crossing exists either within or in the vicinity of a temporary traffic control zone, lane restrictions, flagging or other operations shall not be performed in a manner that would cause highway vehicles to stop on the railroad or light rail transit (LRT) agency tracks, even if automated warning devices are in place. The grade crossing is considered as being 25 feet on either side of the closest rail and furthest rail.

Refer to TA-46 in Chapter 7 for a typical TCP involving grade crossings.

The agencies that are responsible for the operation of the rails shall be contacted when any temporary traffic control zone may directly or indirectly influence the flow of traffic.

6.11 Categories of Work Duration

Factors for determining the number and types of a device to be used in a closure, as well as the traffic control plan that is the best fit for the work zone, the category of work duration is a major factor. Per the MUTCD Section 6G.02, the five categories of work duration and their time at a location shall be:

1. Long-Term Stationary: Work that occupies a location more than 3 days. Work that is to be completed in a long-term stationary closure will include nighttime requirements that will need to be met. Per WAC 296-155-305(7)(b), if flaggers are used on a job that will last more than one day, a current site-specific Traffic Control Plan is required.

2. Intermediate-Term Stationary: Work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour. Intermediate-term stationary projects extend into the hours of darkness, nighttime flagging requirements will need to be met.

3. Short-Term Stationary: Daytime work that occupies a location for more than 1 hour within a single daylight period.

4. Short-Duration: Work that occupies a location up to 1 hour. Safety should not be compromised in short duration work zones, all advance warning signs and required number of channelization devices are still a requirement.

5. Mobile: Work that moves intermittently or continuously. If flaggers are to be used in a mobile work zone, all signs and devices are still a requirement. Per the WAC 296-155-305(8) if a flagger is working in a mobile work zone the flagger must be within 1500 feet of the “Flagger Ahead” sign or symbol and the flagging station must be visible from the sign.

Chapter Seven

Stationary Work Zones

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

The following TCP’s are typical stationary traffic control setups.

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

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

3. **TCP 5 Typical Shoulder Closure-Low Speed (40 mph or Less)**

4. **TCP 6 Typical Shoulder Closure-High Speed (45 mph or Higher)**

5. **TCP 7 Typical Temporary Off-Ramp for Multi-Lane Roadways**

6. **TCP 14 Typical Intersection Lane Closure- Three-Lane Roadway**

7. **TCP 15 Typical Intersection Lane Closure- Five-Lane Roadway**
   Typical urban location with two through lanes each direction and a center turn lane. This plan will most likely need modification or be used as an example in developing a site specific plan to match actual configurations of lanes and turn pockets.

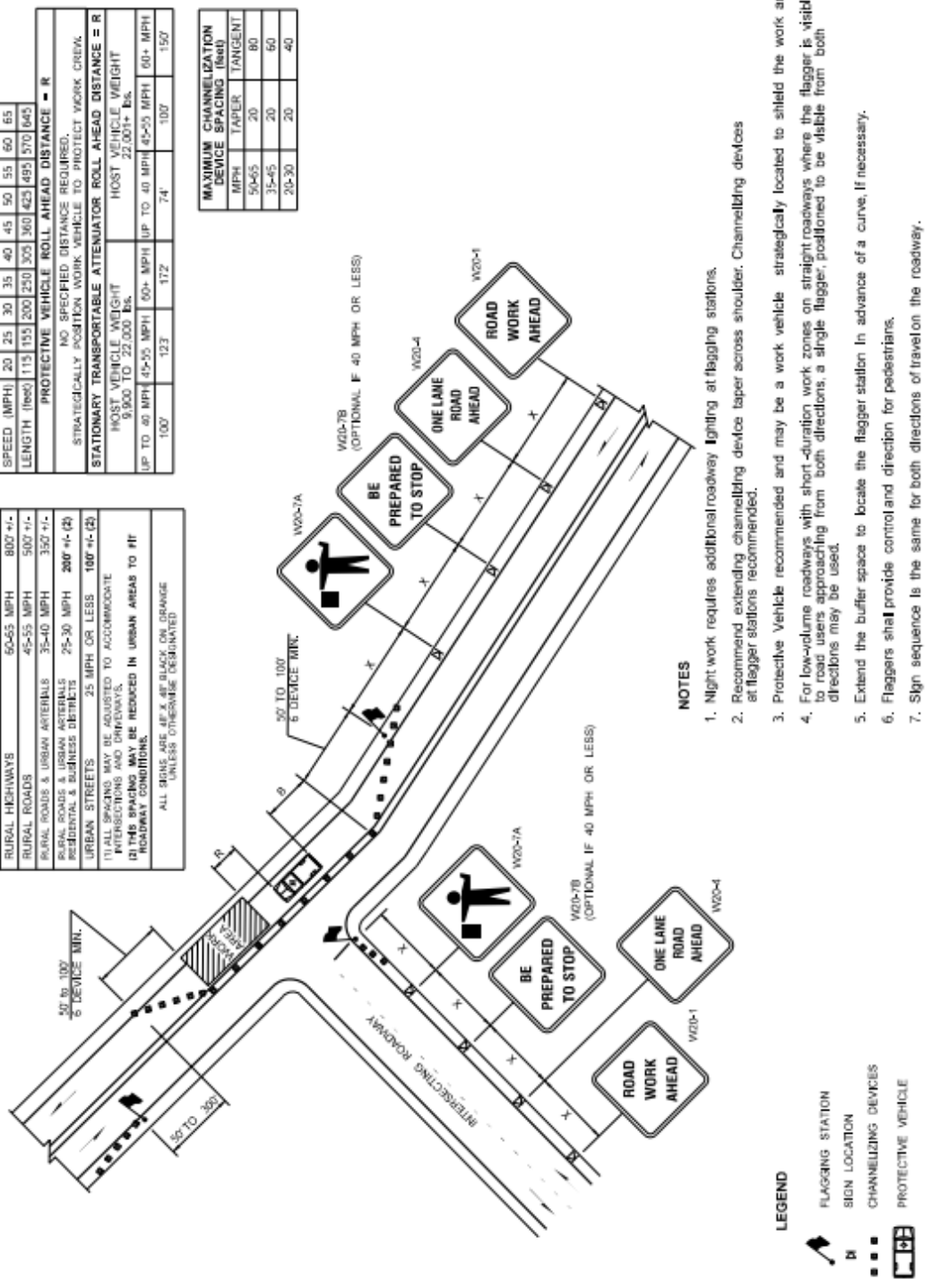
8. **TCP 18 Typical Alternating One-Way Traffic with AFAD**
   This plan provides an example of the signing and device placement for a flagging operation utilizing an AFAD. Consider use of an AFAD for any flagging operation to increase safety.

9. **TCP 19 Typical Roundabout Flagging Operation**

10. **TCP 20 Short Term Traffic Stop with Flaggers**
    For two-lane, two-way roadways when short traffic stops are needed.

11. **TA-46 Work in the Vicinity of a Grade Crossing**

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

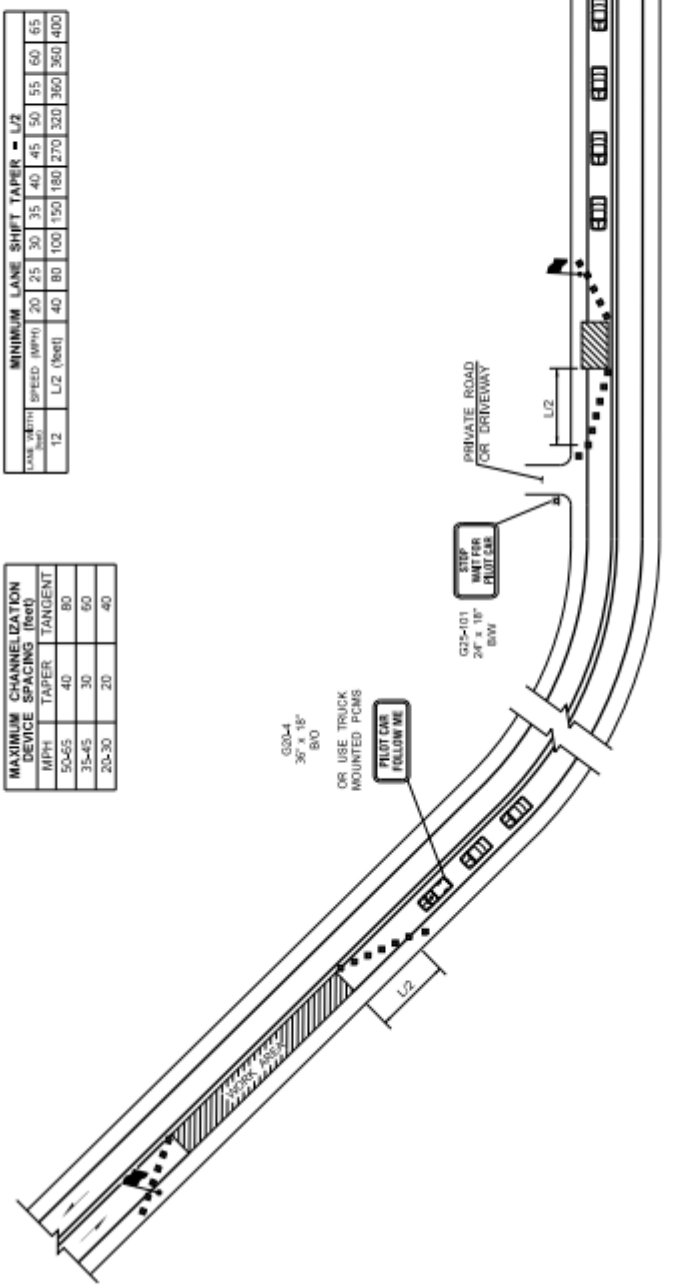


NOTES

1. Night work requires additional roadway lighting at flagging stations.
2. Recommend extending channelizing device taper across shoulder. Channelizing devices at flagger stations recommended.
3. Protective Vehicle recommended and may be a work vehicle strategically located to shield the work area.
4. For low-volume roadways with short-duration work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible from both directions may be used.
5. Extend the buffer space to locate the flagger station in advance of a curve, if necessary.
6. Flaggers shall provide control and direction for pedestrians.
7. Sign sequence is the same for both directions of travel on the roadway.

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

TCP 2 ***Typical Pilot Car Operation***



NOTES

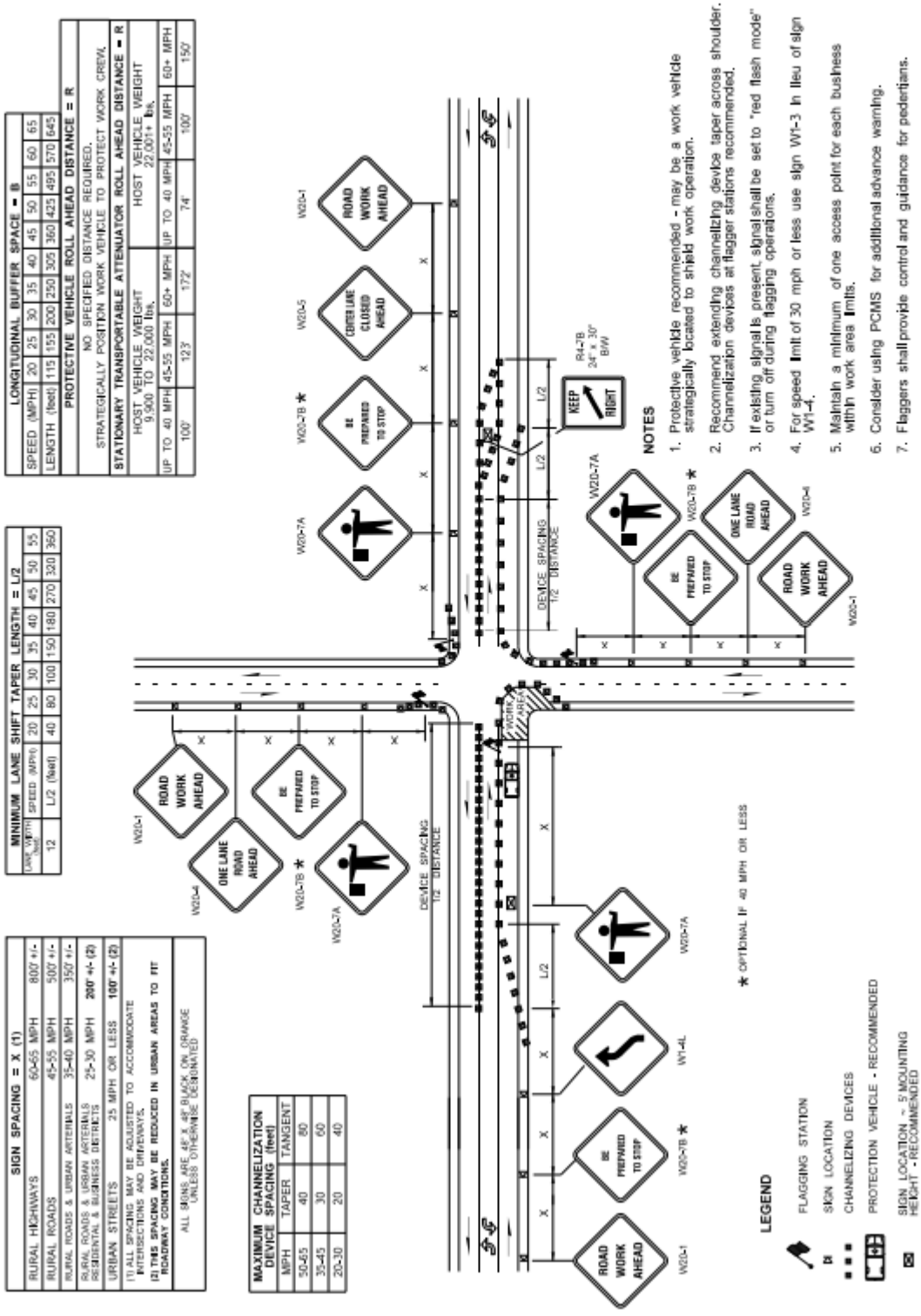
1. Refer to sheet TCP 1 for additional signing and flagging details not shown.
2. Channelizing devices are recommended along centerline to separate traffic from work operation. Devices are required at tapers to shift traffic movement between lanes and for protection at all flagging stations.
3. Sign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

LEGEND

FLAGGING STATION
SIGN LOCATION
CHANNELIZING DEVICES
PILOT VEHICLE
MOTORIST VEHICLE

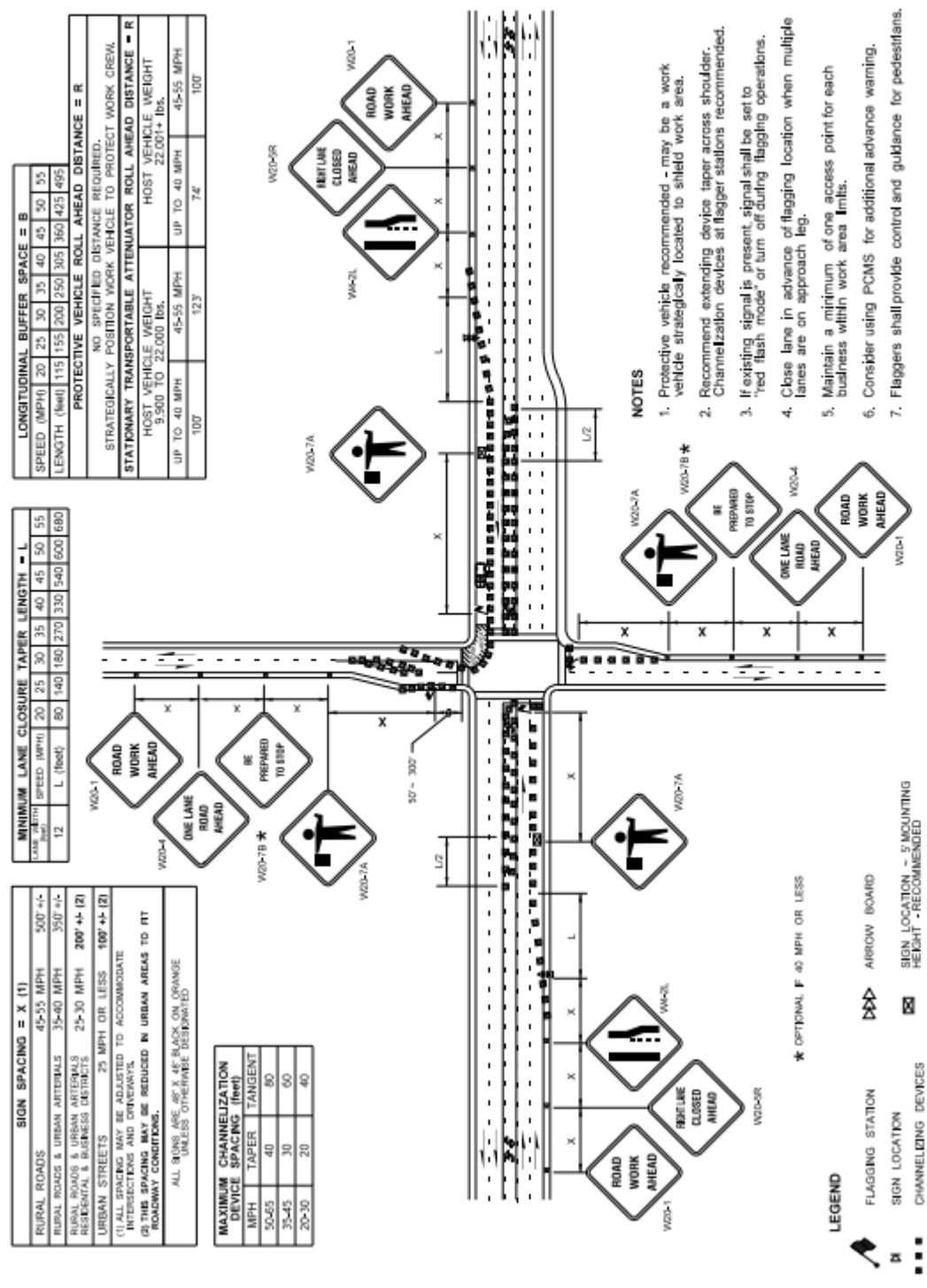
TYPICAL PILOT CAR OPERATION
TCP 2

TCP 5 ***Typical Intersection lane Closure – Three Lane Roadway***



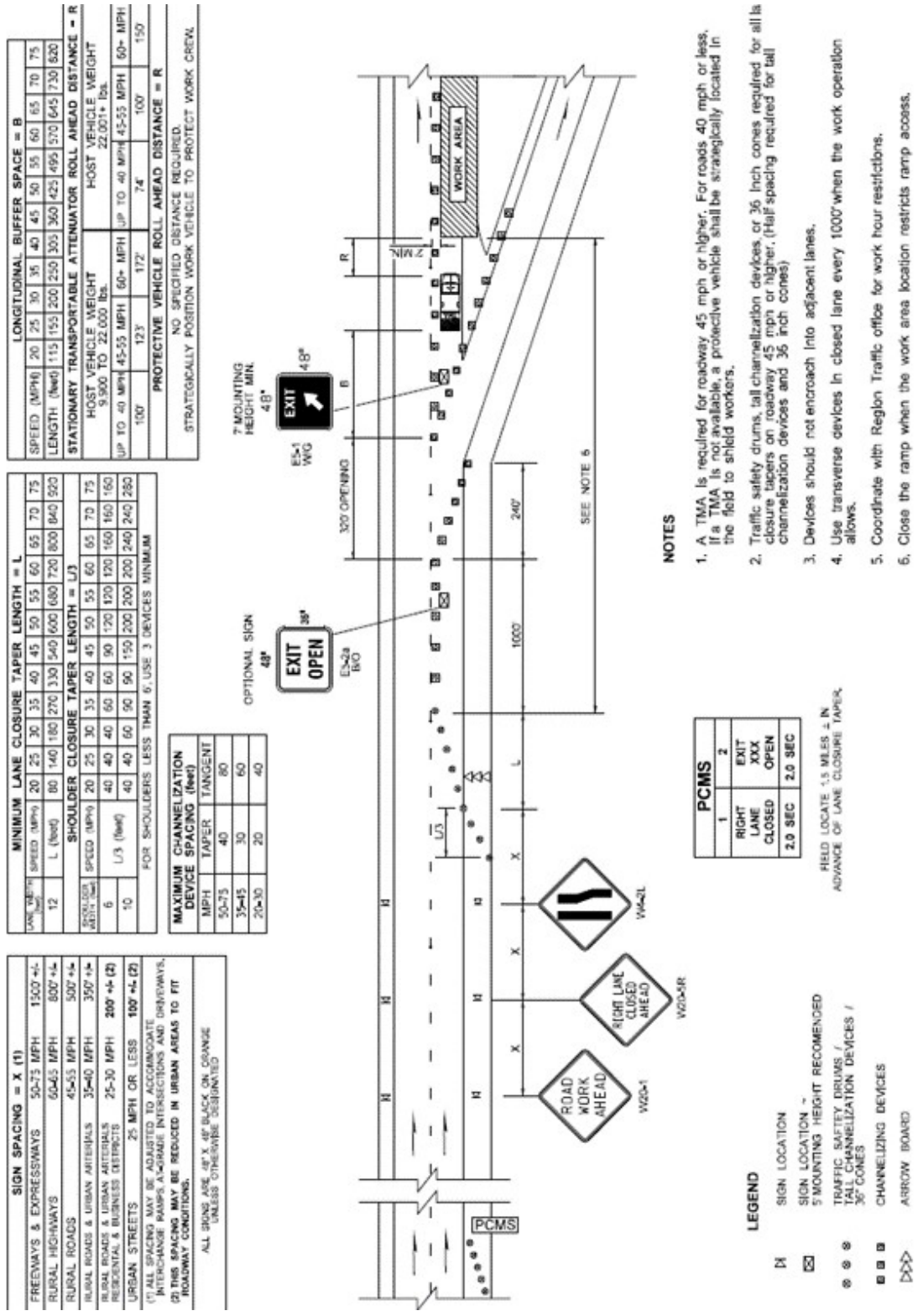
TYPICAL INTERSECTION LANE CLOSURE ~ THREE LANE ROADWAY
TCP 5

TCP 6 ***Typical Intersection Lane Closure – Five Lane Roadway***



TYPICAL INTERSECTION LANE CLOSURE ~ FIVE LANE ROADWAY
TCP 6

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



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

TYPICAL TEMPORARY ON-RAMP FOR MULTI-LANE ROADWAYS
TCP 14

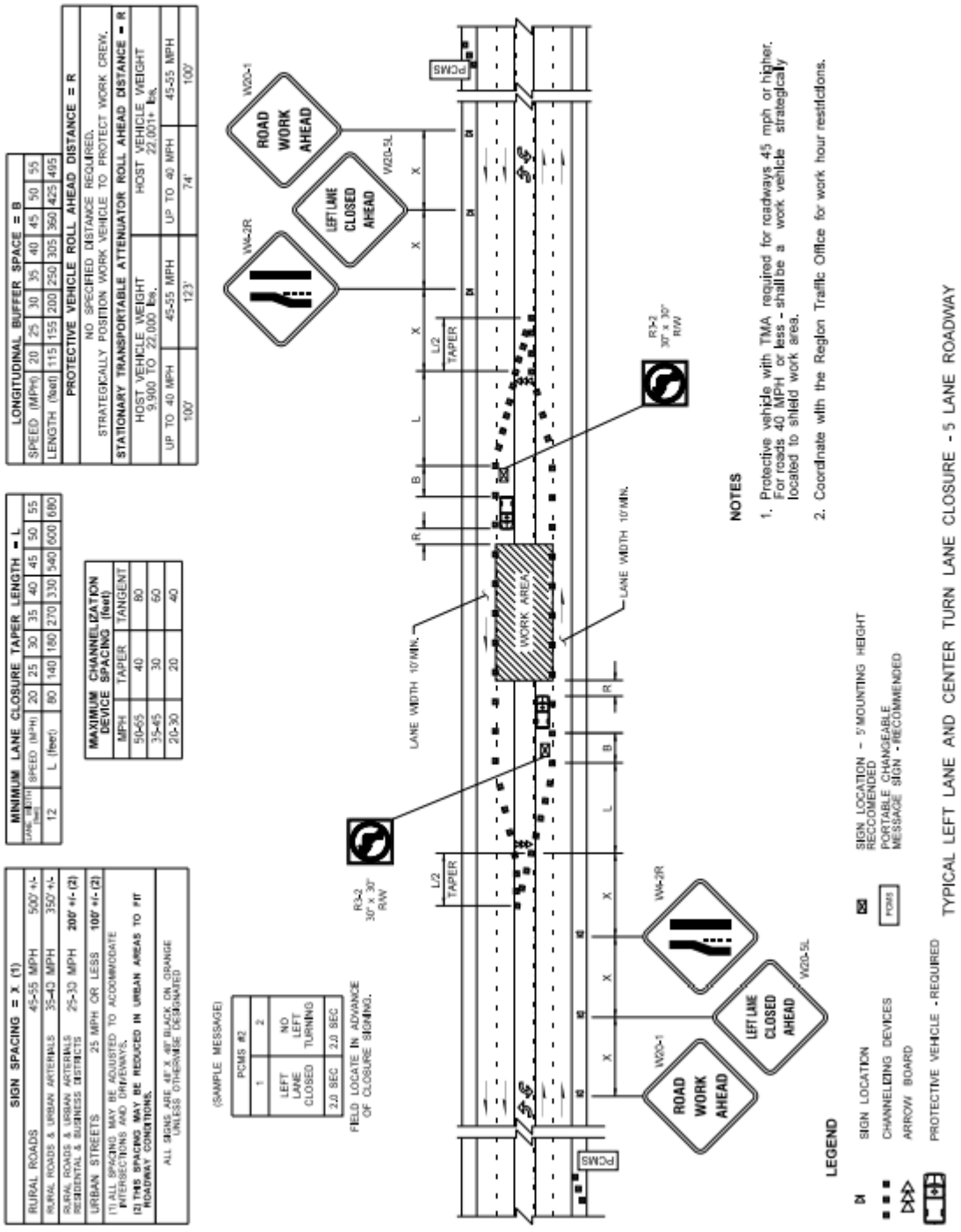
TCP 15 ***Typical Temporary On-Ramp for Multi-Lane Roadways***

NOTES

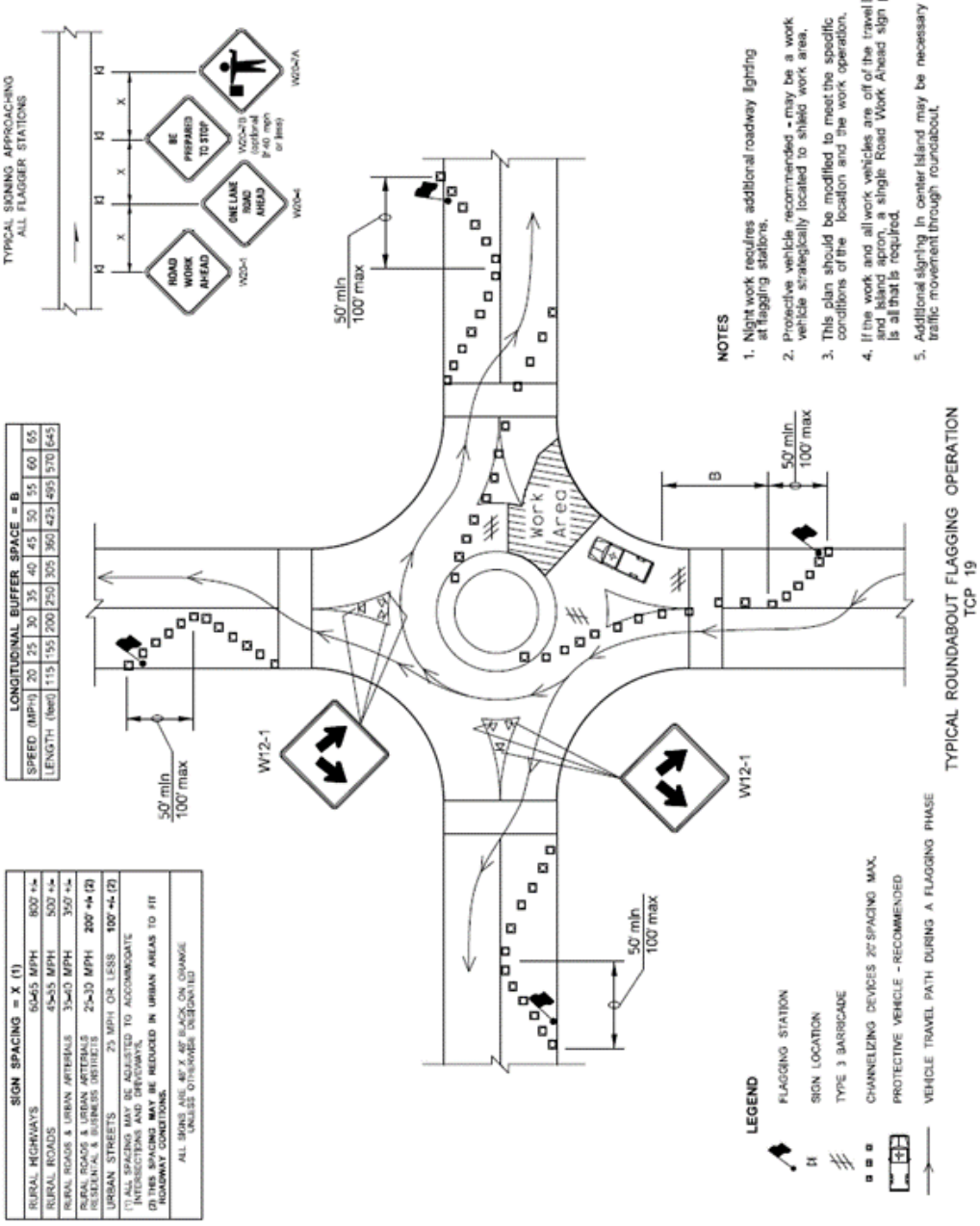
1. A TMA is required for roadway 45 mph or higher. For roads 40 mph or less, if a TMA is not available, a protective vehicle shall be strategically located in the field to shield workers.
2. Traffic safety drums, tall channelization devices, or 36 inch cones required for all lane closure tapers on roadway 45 mph or higher. (Half spacing required for tall channelization devices and 36 inch cones)
3. Devices should not encroach into adjacent lanes.
4. Use transverse devices in closed lane every 1000' when the work operation allows.
5. Downstream taper device spacing should be 20' when a taper is used.
6. Coordinate with Region Traffic office for work hour restrictions.
7. Close the ramp when the work area location restricts ramp access.

TYPICAL TEMPORARY ON-RAMP FOR MULTI-LANE ROADWAYS
TCP 15

TCP 18 *Typical Left Lane and Center Turn Lane Closure – 5 Lane Roadway*

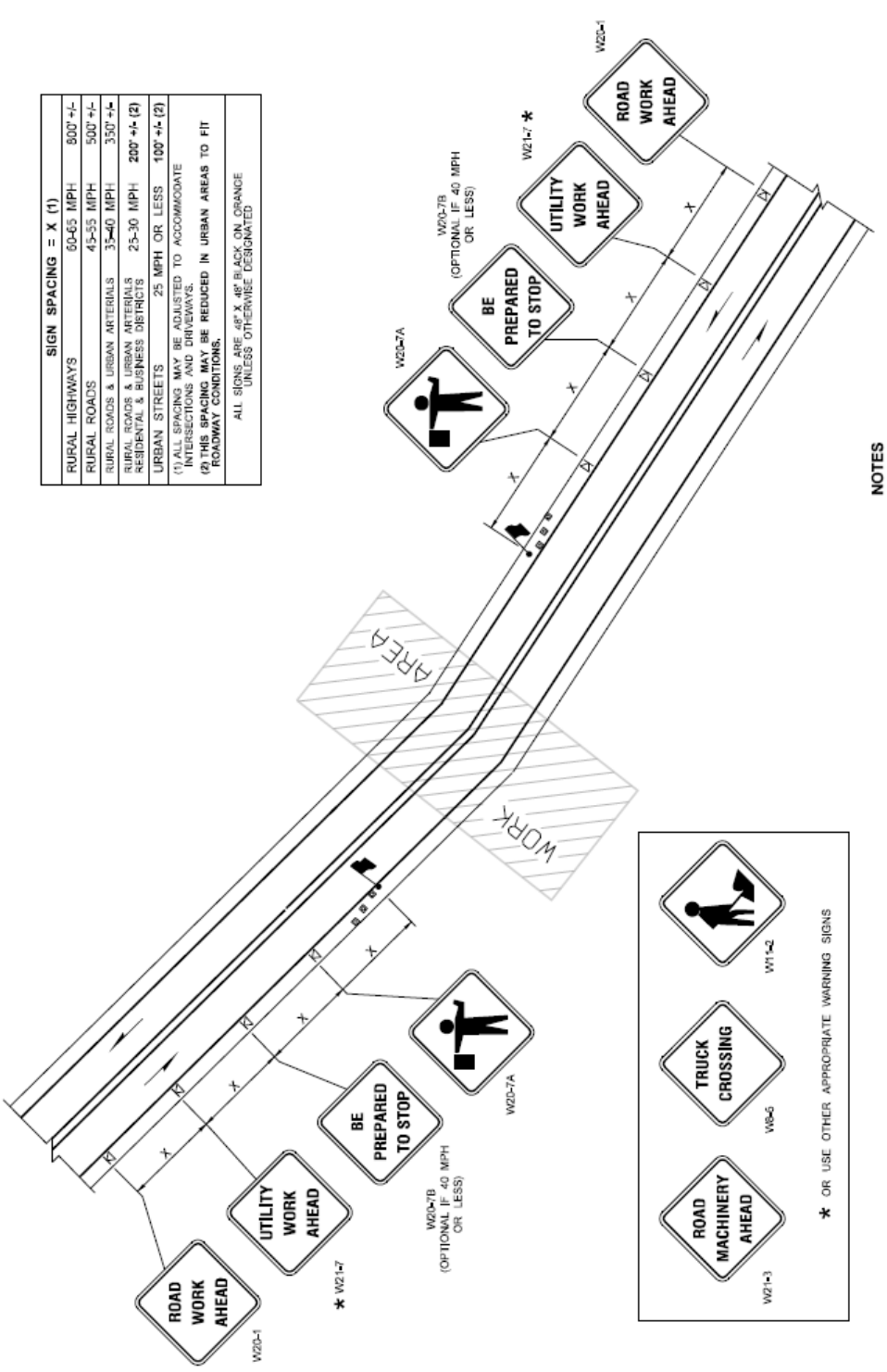


TCP 19 Typical Roundabout Flagging Operation

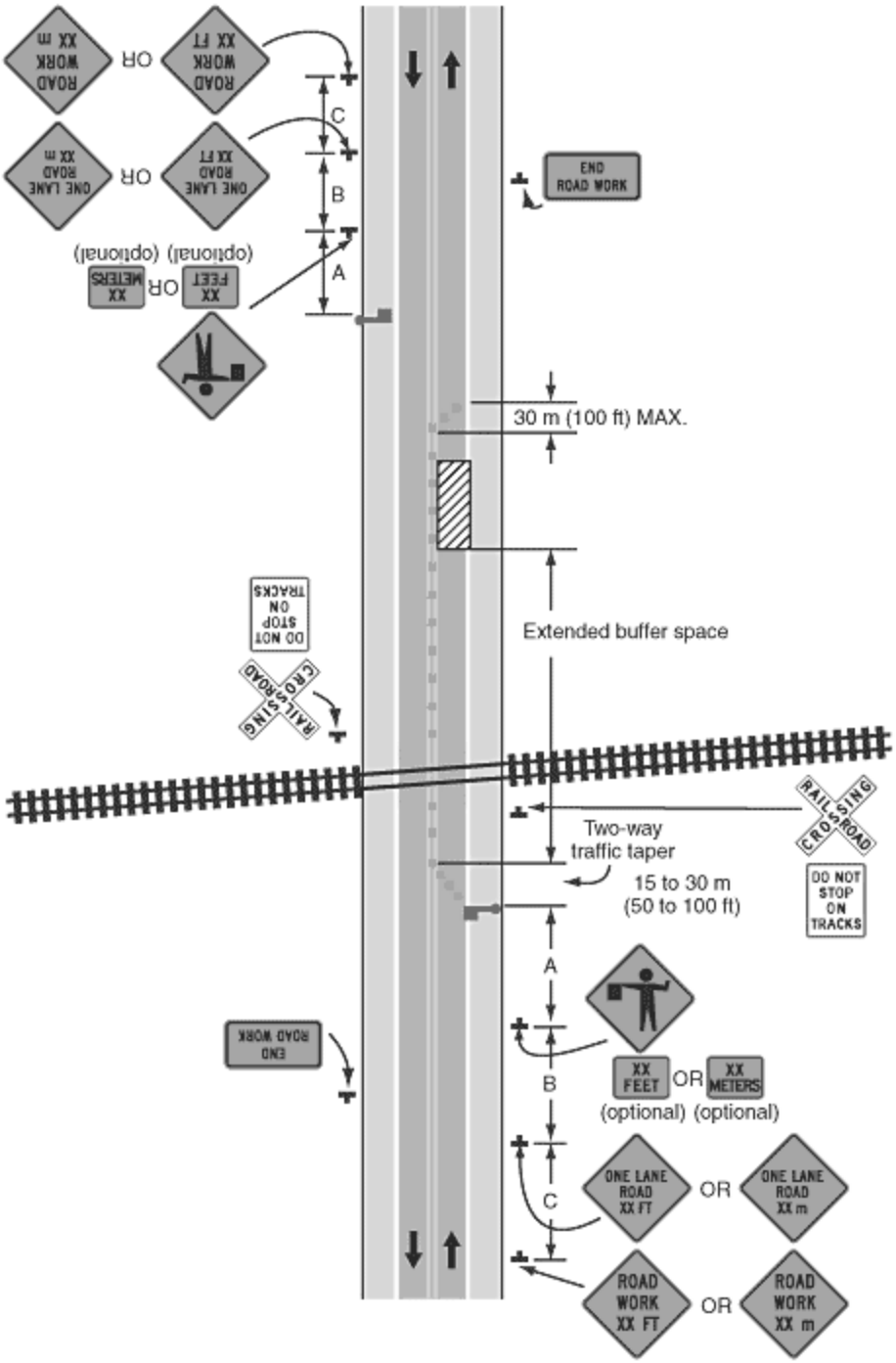


TYPICAL ROUNDABOUT FLAGGING OPERATION
TCP 19

TCP 20 Typical Short Term Traffic Stop with Flaggers



Work in Vicinity of Highway-Rail Grade-Crossing (TA-46)



Typical Application 46

Appendix A: Checklist for Establishing a Temporary Traffic Control Zone

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

Appendix B: References for Additional Work Zone Information

12. FHWA Manual on Uniform Traffic Control Devices (MUTCD)

13. DOSH WAC 296-155-305 Part E: Signaling and Flaggers

14. CDC/NIOSH NIOSH Construction Equipment Visibility Diagrams

15. American Traffic Safety Services Association www.atssa.com

Appendix C: Referenced Manuals

1. Manual on uniform Traffic Control Devices WSDOT
   Work Zone Safety resources webpage
2. DOSH WAC 296-155-305 Part E: Signaling and Flaggers
3. NCHRP Report 350: Recommended Procedures for the Safety Performance Evaluation of Highway Features

Appendix D: Quick Reference Guide

Warning Sign Placement *(Per WAC 296-155-305(8)*

Road Type	Speed	Distances between Advanced Warning Signs*			
		A**	B**	C**	D**
Freeways and Expressways	70 55	1,500 ft +/- or per the MUTCD	1,500 ft +/- or per the MUTCD	1,500 ft +/- or per the MUTCD	1,500 ft +/- or per the MUTCD
Rural Highways	65 60	800 ft. +/-	800 ft. +/-	800 ft. +/-	800 ft. +/-
Rural Roads	55 45	500 ft. +/-	500 ft. +/-	500 ft. +/-	500 ft. +/-
Rural Roads and Urban Arterials	40 35	350 ft. +/-	350 ft. +/-	350 ft. +/-	
Rural Roads, Urban Streets, Residential Business Districts	30 25	200 ft. +/-***	200 ft. +/-***	200 ft. +/-***	
Urban Streets	25 or less	100 ft. ***	100 ft. ***	100 ft. ***	

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

** This refers to the distance between advance warning signs.

*** This spacing may be reduced in urban areas to fit roadway conditions

Channelizing Device Spacing (feet)

MPH	*Taper**	*Tangent*
50/70	**40**	**80**
35/45	**30**	**60**
25/30	**20**	**40**

***Merging/Shifting/Shoulder Tapers**

TAPER/CHANNELIZING DEVICE TABLE

MERGING, SHIFTING & SHOULDER TAPER LENGTHS

AND NUMBER OF CHANNELIZATION DEVICES USED

Lane Width	10 feet				11 feet				12 feet				Shoulder Tapers (Assumes 10' Shoulders)		
	L		1/2L		L		1/2L		L		1/2L		*1/3L		
MPH	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	Merging	Devices	Shifting	Devices	MPH	(ft) Length	Devices
20	70	5	35	3	75	5	40	3	80	5	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*

Finding "L"

SPEED MPH	OFFSET/LANE WIDTH or SHOULDER WIDTH										
	2	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
20	15	20	30	35	40	50	55	60	70	75	80
25	25	35	45	55	65	75	85	95	105	115	125
30	30	45	60	75	90	105	120	135	150	165	180
35	45	65	85	105	125	145	165	185	205	225	245
40	55	80	110	135	160	190	215	240	270	295	320
45	90	135	180	225	270	315	360	405	450	495	540
50	100	150	200	250	300	350	400	450	500	550	600
55	110	165	220	275	330	385	440	495	550	605	660
60	120	180	240	300	360	420	480	540	600	660	720
65	130	195	260	325	390	455	520	585	650	715	780
70	140	210	280	350	420	490	560	630	700	770	840

Appendix E: WAC 296-155-305 Signaling and flaggers.

Definition:

Flagger. A person who provides temporary traffic control.

MUTCD. The Federal Highway Administration's Manual on Uniform Traffic Control as currently modified and adopted by the Washington state department of transportation.

Link: For the current version of the MUTCD, see the department of transportation's website at http://www.wsdot.wa.gov/ and type MUTCD into the search box.

(1) **General requirements for signaling and flaggers.**

(a) You must first apply the requirements in this section. Then you must set up and use temporary traffic controls according to the guidelines and recommendations in Part VI of the MUTCD.

(b) Job site workers with specific traffic control responsibilities must be trained in traffic control techniques, device usage, and placement. Note:

- You may purchase copies of the MUTCD by writing:

U.S. Government Printing Office Superintendent of
Documents

Mail Stop: SSOP,

Washington D.C. 20402-9328

- To view and print a copy of the MUTCD go to http:// www.wsdot.wa.gov/ and type MUTCD into the search box.

(2) **When to use flaggers.**

(a) You must only use flaggers when other reasonable traffic control methods will not adequately control traffic in the work zone.

(b) If signs, signals, and barricades do not provide necessary protection from traffic at work zones and construction sites on or adjacent to a highway or street, then you must use flaggers or other appropriate traffic controls.

(3) **Flagger signaling.**

(a) Flagger signaling must be with sign paddles approved by WSDOT and conform to guidelines and recommendations of MUTCD.

(b) Sign paddles must comply with the requirements of the MUTCD.

(c) When flagging is done during periods of darkness, sign paddles must be retroreflective or illuminated in the same manner as signs.

(d) During emergency situations, red flags, meeting the specifications of the MUTCD, may be used to draw a driver's attention to particularly hazardous conditions. In nonemergency situations, a red flag may be held in a flagger's free hand to supplement the use of a sign paddle.

(4) **Adequate warning of approaching vehicles.** You must:

- Position work zone flaggers so they are not exposed to traffic or equipment approaching them from behind.
  - If this is not possible, then the employer, responsible contractor, and/or project owner must develop and use a method to ensure that flaggers have adequate visual warning of traffic and equipment approaching from behind.

Note: • The following are some optional examples of methods that may be used to adequately warn or protect flaggers: –
Mount a mirror on the flagger's hard hat.
- Use an observer.
- Use "jersey" barriers.

• The department recognizes the importance of adequately trained flaggers and supports industry efforts to improve the quality of flagger training. However, training alone is not sufficient to comply with the statutory requirement of revising flagger safety standards to improve options available that ensure flagger safety and that flaggers have adequate visual warning of objects approaching from behind them.

(5) **High-visibility garments for flaggers.**

(a) While flagging during daylight hours, a flagger must at least wear, as an outer garment:

• A high-visibility safety garment designed according to Class 2 specifications in ANSI/ISEA 107-1999, American National Standard for High-Visibility Safety Apparel.

– Consisting of at least 775 square inches of background material that are fluorescent yellow-green, fluorescent orange-red or fluorescent red in color;

AND

– 201 square inches of retroreflective material that encircles the torso and is placed to provide 360 degrees visibility around the flagger.

• A high visibility hard hat that is white, yellow, yellow-green, orange or red in color.

Note: A high-visibility garment meets Class 2 specifications if the garment:
- Meets the requirements above; **OR**
- Has an ANSI "Class 2" label.

Definition:

Hours of darkness. 1/2 hour before sunset to one-half hour after sunrise.

(b) While flagging during hours of darkness, a flagger must at least wear, as an outer garment:

- A high-visibility safety garment designed according to Class 2 specifications in ANSI/ISEA 107-1999.
- Consisting of at least 775 square inches of background material that are fluorescent yellow-green, fluorescent orange-red or fluorescent red in color;

AND

- 201 square inches of retroreflective material that encircles the torso and is placed to provide 360 degrees visibility around the flagger.

- White coveralls, or other coveralls or trousers that have retro-reflective banding on the legs designed according to ANSI/ISEA 107-1999 standards.
- When snow or fog limit visibility, pants, coveralls, or rain gear, meeting these additional requirements must be worn:

- In a highly visible color;

– With retroreflective banding on the legs;

– Designed according to ANSI/ISEA 107-1999.

• A high-visibility hard hat:

– Marked with at least 12 square inches of retroreflective mate-rial applied to provide 360 degrees of visibility.

Note:ANSI/ISEA 107-1999 is available by:

• Purchasing copies of ANSI/ISEA 107-1999 by writing:

– American National Standards Institute
11 West 42nd Street
New York, NY 10036

OR

– Contacting the ANSI website at http://web.ansi.org/.

OR

• Reading a copy of ANSI/ISEA 107-1999 at any Washington state library.

(6) **Flagger training.** You must make sure that: (a) Each flagger has in their possession:

- A valid Washington traffic control flagger card; or
- A valid flagger card from a state such as:

– Oregon;
– Idaho;
– Montana;

OR

– Other states having a flagger training reciprocity agreement with Washington.

(b) The flagger card shows the following: • Verification that the flagger training required is completed;

- Date the flagger received their flagger training;
- Name of the instructor providing the flagger training;
- Name of the state that issued the flagger card;
- The card's expiration date, not to exceed 3 years from the date of issuance;

AND

- The flagger's picture or a statement that says "valid with photo ID."

(c) Flagger training is based upon the MUTCD.

Exemption: Personnel that have not completed a flagger-training course may be assigned duties as flaggers only during emergencies. Emergency assignments are temporary and last only until a certified flagger can be put into the position.

Definition:

Emergency. An unforeseen occurrence endangering life, limb, or property.

(7) **Flagger orientation and traffic control plan.**

(a) The employer, responsible contractor or project owner must conduct an orientation that familiarizes the flagger with the job site. This requirement applies each time the flagger is assigned to a new project or when job site conditions change significantly.

The orientation must include, but is not limited to:

- The flagger's role and location on the job site;
- Motor vehicle and equipment in operation at the site;
- Job site traffic patterns;
- Communications and signals to be used between flaggers and equipment operators;
- On-foot escape route;

AND

• Other hazards specific to the job site.

(b) If flaggers are used on a job that will last more than one day, then the employer, responsible contractor and/or project owner must keep on-site, a current site specific traffic control plan. The purpose of this plan is to help move traffic through or around the construction zone in a way that protects the safety of the traveling public, pedestrians and workers.

The plan must include, but is not limited to, the following items when they are appropriate:

- Sign use and placement;
- Application and removal of pavement markings;
- Construction;
- Scheduling;
- Methods and devices for delineation and channelization;
- Placement and maintenance of devices;
- Placement of flaggers;
- Roadway lighting;
- Traffic regulations;

AND

• Surveillance and inspection.

(8) **Advance warning signs.**

(a) You must provide the following on all flagging operations:

- A 3 sign advance warning sequence on all roadways with a speed limit below 45 mph.
- A 4 sign advance warning sequence on all roadways with a 45 mph or higher speed limit.

(b) Warning signs must reflect the actual condition of the work zone. When not in use, warning signs must either be taken down or covered.

(c) You must make sure to follow Table 1 for spacing of advance warning sign placement.

Table 1. Advanced Warning Sign Spacing

Road Type	Speed	Distances Between Advance Warning Signs*			
		A**	B**	C**	D**
Freeways & Expressways	70 55	1,500 ft.+/- or per the MUTCD.	1,500 ft.+/- or per the MUTCD.	1,500 ft.+/- or per the MUTCD.	1,500 ft.+/- or per the MUTCD.
Rural Highways	65 60	800 ft.+/-	800 ft.+/-	800 ft.+/-	800 ft.+/-
Rural Roads	55 45	500 ft.+/-	500 ft.+/-	500 ft.+/-	500 ft.+/-
Rural Roads and Urban Arterials	40 35	350 ft.+/-	350 ft.+/-	350 ft.+/-	N/A
Rural Roads, Urban Streets, Residential Business Districts	30 25	200 ft.***	200 ft.***	200 ft.***	N/A
Urban Streets	25 or less	100 ft.***	100 ft.***	100 ft.***	N/A

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

** This refers to the distance between advance warning signs. See Figure 1, Typical Lane Closure on Two-Lane Road. This situation is typical for roadways with speed limits less than 45 mph.

***This spacing may be reduced in urban areas to fit roadway conditions.

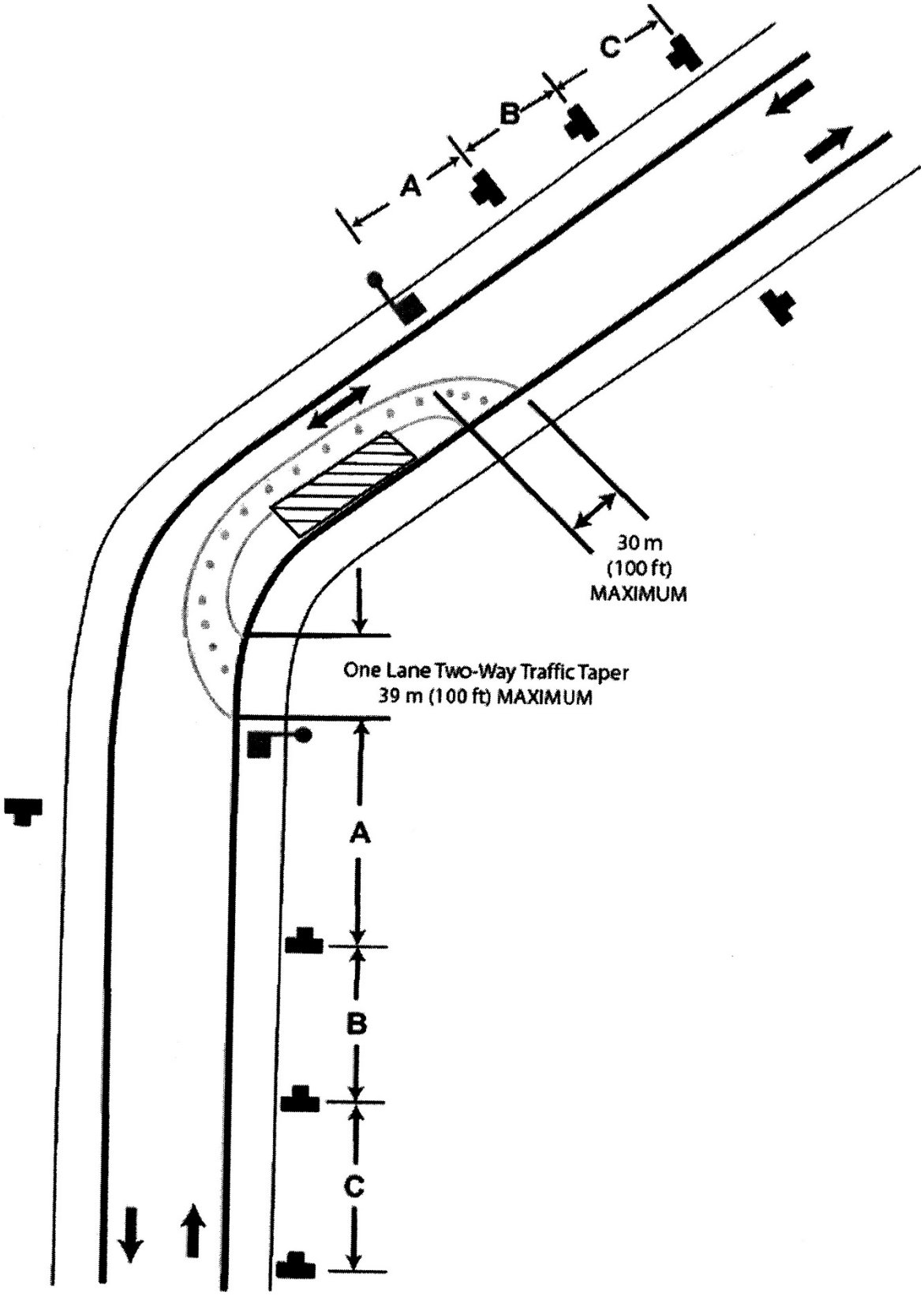
Exemption: In a mobile flagging operation, as defined by the MUTCD when the flagger is moving with the operation, the "flagger ahead (symbol or text)" sign must be:

- Within 1,500 feet of the flagger;

AND

- The flagger station must be seen from the sign.

If terrain does not allow a motorist to see the flagger from the "flagger ahead" sign, the distance between the flagger and the sign must be shortened to allow visual contact, but in no case can the distance be less than the distance specified in Table 1, Advanced Warning Sign Spacing.



(9) **Providing a safe job site for flaggers.** Employers, responsible contractors and/or project owners must make sure that:

(a) Flagger stations are located far enough in advance of the work space so that the approaching road users will have sufficient distance to stop before entering the work space. Follow Table 2 for the distance of the flagger workstation in advance of the work space.

Table 2. Distance of Flagger Station in Advance of the Work Space

Speed* (mph)	Distance (ft)**
20	35
25	55
30	85
35	120
40	170
45	220
50	280
55	335
60	415
65	485

* Posted speed, off-peak 85th-percentile speed prior to work starting or the anticipated operating speed.

** This spacing may be reduced to fit roadway and worksite conditions. Distances greater than those listed in the table are acceptable.

(b) Flaggers stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users. A flagger must only stand in the lane being used by moving road users after road users have stopped.

Definition:

Road user. A vehicle operator, bicyclist, or pedestrian within a public roadway, including workers in temporary traffic control zones.

(c) Flagger workstations are illuminated during hours of darkness by floodlights that do not create glare that poses a hazard for drivers.

Note: To identify potential glare, observe the lighted area from various directions and angles on the main roadway after initial floodlight setup.

Exemption: Emergency situations are exempt from these illumination requirements. For the purpose of this rule, ***emergency*** means an unforeseen occurrence endangering life, limb, or property.

(d) Flaggers are not assigned other duties while engaged in flag-ging activities.

(e) Flaggers do not use devices that may distract the flagger's vision, hearing, or attention.

- Examples of these devices include cell phones, pagers, radios, and headphones.
- Devices such as two-way radios used for communications between flaggers to direct traffic or ensure flagger safety are acceptable.

(f) Flaggers receive a rest period of at least 10 minutes, on the employer's time, for each 4 hours of working time.

- Rest periods must be scheduled as near as possible to the mid-point of the work period.
- A flagger must not be allowed to work more than 3 hours without a rest period.

Exemption: Scheduled rest periods are not required where the nature of the work allows a flagger to take intermittent rest period's equivalent to 10 minutes for each 4 hours worked.

[Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060. WSR 16-09-085, § 296-155-305, filed 4/19/16, effective 5/20/16. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050, 49.17.060, and 29 C.F.R. 1926.201. WSR 13-24-099, § 296-155-305, filed 12/3/13, effective 1/6/14. Statutory Authority: RCW 49.17.010, 49.17.040, 49.17.050,

49.17.060. WSR 07-03-163, § 296-155-305, filed 1/24/07, effective 4/1/07; WSR 06-05-027, § 296-155-305, filed 2/7/06, effective 4/1/06; WSR 04-24-089, § 296-155-305, filed 12/1/04, effective 1/1/05; WSR 03-06-075, § 296-155-305, filed 3/4/03, effective 8/1/03. Statutory Authority: RCW 49.17.010, [49.17].040, [49.17].050, 2000 c 239, and chapter 34.05 RCW. WSR 01-04-015, § 296-155-305, filed 1/26/01, effective 2/28/01. Statutory Authority: Chapter 49.17 RCW. WSR 93-19-142 (Order 93-04), § 296-155-305, filed 9/22/93, effective 11/1/93; WSR 93-01-067 (Order 92-15), § 296-155-305, filed 12/11/92, effective 1/15/93; WSR 89-11-035 (Order 89-03), § 296-155-305, filed 5/15/89, effective 6/30/89. Statutory Authority: RCW 49.17.040 and 49.17.050. WSR 86-03-074 (Order 86-14), § 296-155-305, filed 1/21/86; Order 76-6,

§ 296-155-305, filed 3/1/76; Order 74-26, § 296-155-305, filed 5/7/74, effective 6/6/74.]