

NJDOT's Work Zone Safety Set-up Guide



Temporary Traffic Control



Work Zone Safety Set-Up Guide

Table of Contents

| | |
|---|----------|
| Forward and Information | I - VIII |
| Contacts Numbers and References | IX |
| Types of Tapers and Number of Cones Chart | X - XII |
| Typical Application Diagrams w/Notes | |
| Legend | 1 |
| Parts of a Temporary Traffic Control Zone | 2 - 3 |
| Work Beyond Shoulder | 4 - 5 |
| Short Duration or Mobile Operation on Shoulder - Multi-Lane Road | 6 - 7 |
| Mobile Operation in Center Median | 8 - 9 |
| Short-Term Stationary Operation in Center Median | 10 - 11 |
| Work Area in Shoulder for Speed less than 45MPH | 12 - 13 |
| Work Area in Shoulder for Speed 45 MPH or Greater | 14 - 15 |
| 2 Lane Road Mobile Operation | 16 - 17 |
| 2 Lane Road Short Duration or Mobile Operation in Shoulder | 18 - 19 |
| 2 Lane Road Shoulder Work with Minor Encroachment | 20 - 21 |
| 2 Lane Road Work Area in Center of Road | 22 - 23 |
| 2 Lane Road Work Area in One Lane | 24 - 25 |
| Lane Closure on a 2 Lane Road using Flaggers | 26 - 29 |
| Surveying Along the Center Line of Road | 30 - 31 |
| Multi-Lane Road Divided Work Area in Left Lane | 32 - 33 |
| Multi-Lane Road Divided Work Area in Right Lane | 34 - 35 |
| Multi-Lane Road Undivided Work Area in Left Lane | 36 - 37 |
| Multi-Lane Road Undivided Work Area Closed One Direction | 38 - 39 |
| Mobile Operation on Multi-Lane Road - Right Lane Closed | 40 - 41 |
| Mobile Operation on Multi-Lane Road - Left Lane Closed | 42 - 43 |
| Mobile Operation on Multi-Lane Road - Right 2 Lanes Closed | 44 - 45 |
| Mobile Operation on Multi-Lane Road - Left 2 Lanes Closed | 46 - 47 |
| Right Two Lanes Closed - Multi-Lane Road | 48 - 49 |
| Left Two Lanes Closed - Multi-Lane Road | 50 - 51 |
| Work Area in Left Lane at Intersection - Far Side | 52 - 53 |
| Multi-Lane Road Undivided - Work Area in Left Lane at Intersection - Near Side | 54 - 55 |
| Multi-Lane Road Undivided - Work Area in Right Lane at Intersection - Far Side | 56 - 57 |
| Multi-Lane Road Undivided - Work Area in Right Lane at Intersection - Near Side | 58 - 59 |
| Multi-Lane Road Undivided - Work in the Vicinity of an Exit Ramp | 60 - 61 |
| Work in the Vicinity of an Exit Ramp | 62 - 63 |
| Work in the Vicinity of an Entrance Ramp - Merge Required | 64 - 65 |
| Work in the Vicinity of an Entrance Ramp - Added Lane | 66 - 67 |
| Traffic Incident Management (TIM) | 68 - 72 |
| Traffic Signals – Emergency Lamp Out | 73 |

WORK ZONE SAFETY SET-UP GUIDE

FORWARD

It is the responsibility of the Work Zone Safety trained personnel, to institute the placement of all appropriate cautionary traffic safety devices and controls as may be required for a particular work zone activity such as, highway work zone, traffic incident management areas, and electrical maintenance situations etc. Traffic protection devices shall be placed in accordance with the diagrams shown in this **New Jersey Department of Transportation's, (NJDOT) Work Zone Safety Set-Up Guide.**

The Work Zone Safety Set-Up Guide should be used in conjunction with the **Federal Manual on Uniform Traffic Control Devices (MUTCD) version 2009, Part 6 – Temporary Traffic Control.**

This guide sets forth minimum standards for normal traffic situations and additional protection should be considered when special complexities and hazards prevail.

It is the responsibility of the Work Zone Safety Trained Personnel, to institute the placement of all appropriate cautionary traffic safety devices and controls as may be required for a particular activity (highway work zone, traffic incident management areas, electrical maintenance situations, etc.).

The person in-charge of the safety or his/her designee, should review the safety set-up, drive and check the set-up from a driver's view. If the operation is for a longer duration, the inspection should be done periodically.

In the event the Work Zone Safety Set-Up Guide does not address a particular work zone/incident, the MUTCD and/or the traffic engineer shall prevail in all decisions made for a Work Zone. A road crew's responsibility is always the safety of its employees and the expeditious movement of the traveling public through a work zone/incident site.

NOTICE

This Work Zone Safety Set-Up Guide is intended to provide reasonably current and accurate information and is designed to serve as a field operational reference only. Please refer to the MUTCD for complete details.

All devices used for traffic control shall meet the crashworthy criteria as required according to the current **"Federal Highway Administration (FHWA)"** policy. e.g., Devices meeting the American Association of State Highway Transportation Officials (AASHTO's), Manual for Assessing Safety Hardware (MASH) guidance document shall be considered crashworthy.

The condition of devices shall meet a quality standard for acceptability. For determining quality, the **"American Traffic Safety Services Association (ATSSA) Quality Guidelines for Temporary Traffic Control Devices"**, or **"Manual for Assessing Safety Hardware (MASH) Guidelines"** shall be used.

WORK ZONE SAFETY SET-UP GUIDE



HIGH-VISIBILITY APPAREL

During daytime and nighttime activities, workers shall wear high-visibility safety apparel that meets the ANSI/ISEA 107 standard entitled "American National Standard for High-Visibility Apparel" and labeled as meeting the Performance Class 3 risk exposure.

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 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. Flame resistant apparel (FR) is required if the wearer is exposed to ARC/Electrical hazard or flames.

The Manual on Uniform Traffic Control Devices (MUTCD) requires all workers, including construction, maintenance, utility, emergency responders, and volunteers operating on or near any public access roadway, to wear high-visibility safety apparel (HVSA).



FLAGGING

Flaggers are responsible for public safety and have the most contact with the public of all highway workers. Flaggers should be trained in safe traffic control practices and techniques. Flaggers should be able to satisfactorily demonstrate the following abilities:

- Ability to receive and communicate specific instructions clearly, firmly, and courteously.
- Ability to move and maneuver quickly to avoid danger from errant vehicles.
- Ability to control signaling devices (such as paddles and flags) to provide clear and positive guidance to drivers approaching a temporary traffic control (TTC) zone in frequently changing situations.
- Ability to understand and apply safe traffic control practices, often in stressful or emergency situations, and,
- Ability to recognize dangerous traffic situations and be capable of warning workers quickly to avoid accidents and injuries.
- For guidelines on flagging operations, refer to diagram #14 (14C – 2 Lane Road using Flaggers).

WORK ZONE SAFETY SET-UP GUIDE

CATEGORIES OF WORK DURATIONS

Intermediate Term Stationary: Is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.

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

Short Duration: Is work that occupies a location up to 1 hour.

Mobile Operation: Is work that moves intermittently or continuously.

ADVANCE WARNING SIGNS



Advance Warning Signs shall be fluorescent Orange in color, with approved legends and shall be 48" X 48" in size. Wherever possible, the distance of the advance warning signs should be increased if the sight distance is restricted due to the presence of a vertical or horizontal curve.

The distance from the bottom of the advance warning sign to the bottom of the supports is 1 ft MIN. above the traveled way. TTC zone signs convey both general and specific messages by means of words, symbols, and/or arrows and include the same three categories as all road user signs regulatory, warning, and guide.

Signs are warranted on the left side of the highway if the highway is more than two lanes wide in the direction of where the work is being performed, and the physical median is at least eight (8) feet wide.

Signs mounted on portable sign supports may be placed in the grass. Temporary traffic control devices can be evaluated by using the ATSSA Quality Guidelines temporary for traffic control devices.

WORK ZONE SAFETY SET-UP GUIDE

VARIABLE MESSAGE SIGNS (VMS)

VMS can be used to supplement the existing safety setup. A portable VMS can be placed in a clear and visible location off the roadway, with as much sight distance as possible. Transportation Mobility (formally Traffic Operations) should be consulted for appropriate messages, programming, and recommended distance placement.



ARROW PANELS

Arrow Panels shall meet the MUTCD criteria. If the work area is closer to the taper, a Truck Mounted Attenuator (TMA) with an Arrow Panel should replace a stand-alone Arrow Panel. The 4-corner configuration is the preferred Caution Mode. Use of the single bar is acceptable when the arrow board does not allow the 4-corner configuration. Tow behind Arrow Panels shall stand-alone and be disconnected from the towing vehicle. The towing vehicle shall not remain in the closed lane or shoulder.



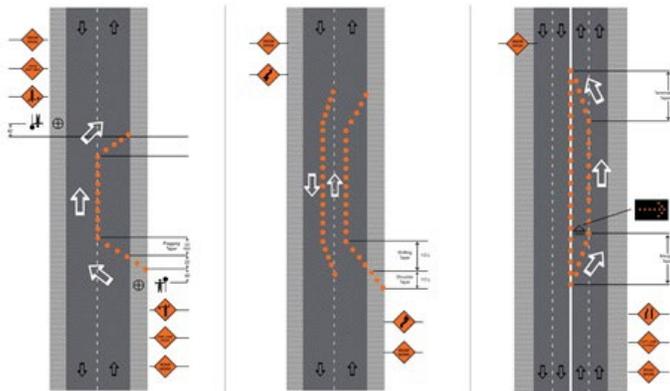
CONES & DRUMS

Cones are used in a Temporary Traffic Control (TTC) zone and are essential to highway maintenance operations and the management of traffic work zones/incidents. Cones are orange in color, a minimum of 28 inches high, with two reflective bands. Faded cones or those covered with asphalt, tar, paint, or other substances that cannot be cleaned, must be removed from service.

Drums shall be used when the planned closure is for 48 continuous hours or more and the posted speed limit is 45 MPH or more.

WORK ZONE SAFETY SET-UP GUIDE

TAPERS



Tapers may be used in both the transition and termination areas. Whenever tapers are to be used near an interchange ramp, crossroads, curves, or other influencing factors, the length 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 traffic path.

Longer (or extended) tapers are not necessarily better than shorter tapers (particularly in urban areas with characteristics such as short block lengths or driveways) because long or extended tapers tend to encourage sluggish operation and to encourage drivers to delay lane changes unnecessarily.

MOBILE OPERATIONS

Mobile operations often involve frequent short stops for activities such as litter cleanup, pothole patching, animal carcass pickup, utility operations or similar to short-duration operations. Warning signs and high intensity rotating, flashing, oscillating, or strobe lights should be used on the vehicles that are participating in the mobile work.

Mobile operations also include work activities where workers and equipment move along the road without stopping, usually at slow speeds. The advance warning area moves with the work area.

When mobile operations are being performed, a shadow vehicle equipped with a Truck Mounted Attenuator (TMA), arrow board and tailgate mounted sign should follow the work vehicle, especially when vehicular traffic speeds or volumes are high.

Under high-volume conditions, consideration should be given to scheduling mobile operations work during off-peak hours. If there are mobile operations on a high-speed travel lane of a multi-lane divided highway, arrow boards should be used.

WORK ZONE SAFETY SET-UP GUIDE

SHADOW VEHICLES

Trucks and/or trailers are often used as shadow vehicles to protect workers or work equipment from errant vehicles. These shadow vehicles are normally equipped with flashing arrows, changeable message signs, as well as high intensity rotating, flashing, oscillating, or strobe lights located properly in advance of the workers and/or equipment that they are protecting.

The shadow truck should be positioned within a sufficient distance in advance of the workers or equipment being protected so that there will be sufficient distance, but not so much so that errant vehicles will travel around the shadow truck and strike the protected workers and/or equipment.

The suggested distance of 100 feet applies to the shadow vehicle(s) closest to the work zone/incident. The distance for additional protection vehicle(s) needs to be adjusted to actual site conditions to prevent vehicles from entering the work zone/incident.



TRUCK MOUNTED ATTENUATOR (TMA)

Truck mounted attenuators shall be energy-absorbing devices attached to the rear of shadow trailers or trucks. If used, the shadow vehicle with the attenuator shall be located in advance of the work area, workers, or equipment to reduce the severity of rear-end crashes from errant vehicles.



INTERSECTION OPTIONS

A planned detour may be requested through the proper authority, who would direct traffic. A Uniformed law enforcement officer with vehicle lights activated may be utilized to assist with the flow of traffic. In the event that there is heavy truck traffic turning right into the work zone/incident, an opposing left lane closure may be installed.

WORK ZONE SAFETY SET-UP GUIDE



EMERGENT CONDITIONS

An “Emergent Condition” is an unplanned, unexpected, emergency operation that requires a prompt and urgent response to address an immediate hazard to the motoring public. An immediate hazard may be defined as an event that results in an unexpected situation urgently requiring prompt action.

Examples include but are not limited to large debris in the travel lanes: large debris in the shoulder that may find its way into the travel lanes; disabled vehicles in the travel lanes or shoulder; snow and ice control. On-scene personnel shall activate high-intensity rotating, flashing oscillating or strobe lights on their vehicles when working to clear emergent conditions from the roadway.

For additional information related to emergent conditions in traffic incident management areas and emergency vehicle lighting usage, refer to the Traffic Incident Management (TIM) section of this guide.

PEDESTRIAN AND WORKER SAFETY



Pedestrian Safety Considerations: Reference the MUTCD Section 6D

A wide range of pedestrians might be affected by TTC zones, including the young, elderly, and individuals with disabilities (hearing or visual impaired etc.). These individuals require a clearly delineated and usable travel path to accommodate their special needs.

The following three items should be considered when planning for pedestrians in TTC zones:

- Pedestrians should not be led into conflicts with vehicles, equipment, and operations.
- Pedestrians should not be led into conflicts with vehicles moving through or around the worksite.
- Pedestrians should be provided with a convenient and accessible path that replicates as nearly as practical the most desirable characteristics of the existing sidewalk(s) or footpath(s).

WORK ZONE SAFETY SET-UP GUIDE

WORKER SAFETY CONSIDERATION

Reference the MUTCD Section 6D

The safety of workers is equally important as the safety of the road users traveling through the TTC Zone. The best protection for both is through the establishment of a good work zone traffic control.

Workers should be trained to work next to motor vehicle traffic in a way that minimizes their vulnerability. Workers having specific TTC responsibilities should be trained in TTC techniques, device usage, and placement.

Workers within the right-of-way who are exposed to traffic or to work vehicles and construction equipment within the TTC zone shall wear high-visibility safety apparel.

CONTACTS AND REFERENCES

| <u>CONTACTS</u> | |
|---|--|
| EMERGENCIES | 911 |
| NJDOT General Information | 609-963-2200 www.state.nj.us/transportation/ |
| NJDOT Bureau of Employee Safety | 609-963-2175 |
| NJDOT Central Dispatch Unit (CDU) | 609-588-6212 |
| New Jersey Department of Transportation Transportation Operations Systems and Support (TOS&S) Permits | www.state.nj.us/transportation/business/epermits/ |
| <p>NJ One Call NJDOT is <u>not</u> part of New Jersey's One-Call Damage Prevention System, which is maintained by New Jersey utility companies in response to the Underground Facility Protection Act (N.J.S.A. 48:2-73 et seq.).</p> <p>Calls to 1-800-272-1000 are not sufficient to cover work within NJDOT Right-of-Ways.</p> | <p>1-800-272-1000 www.nj1-call.org/</p> |

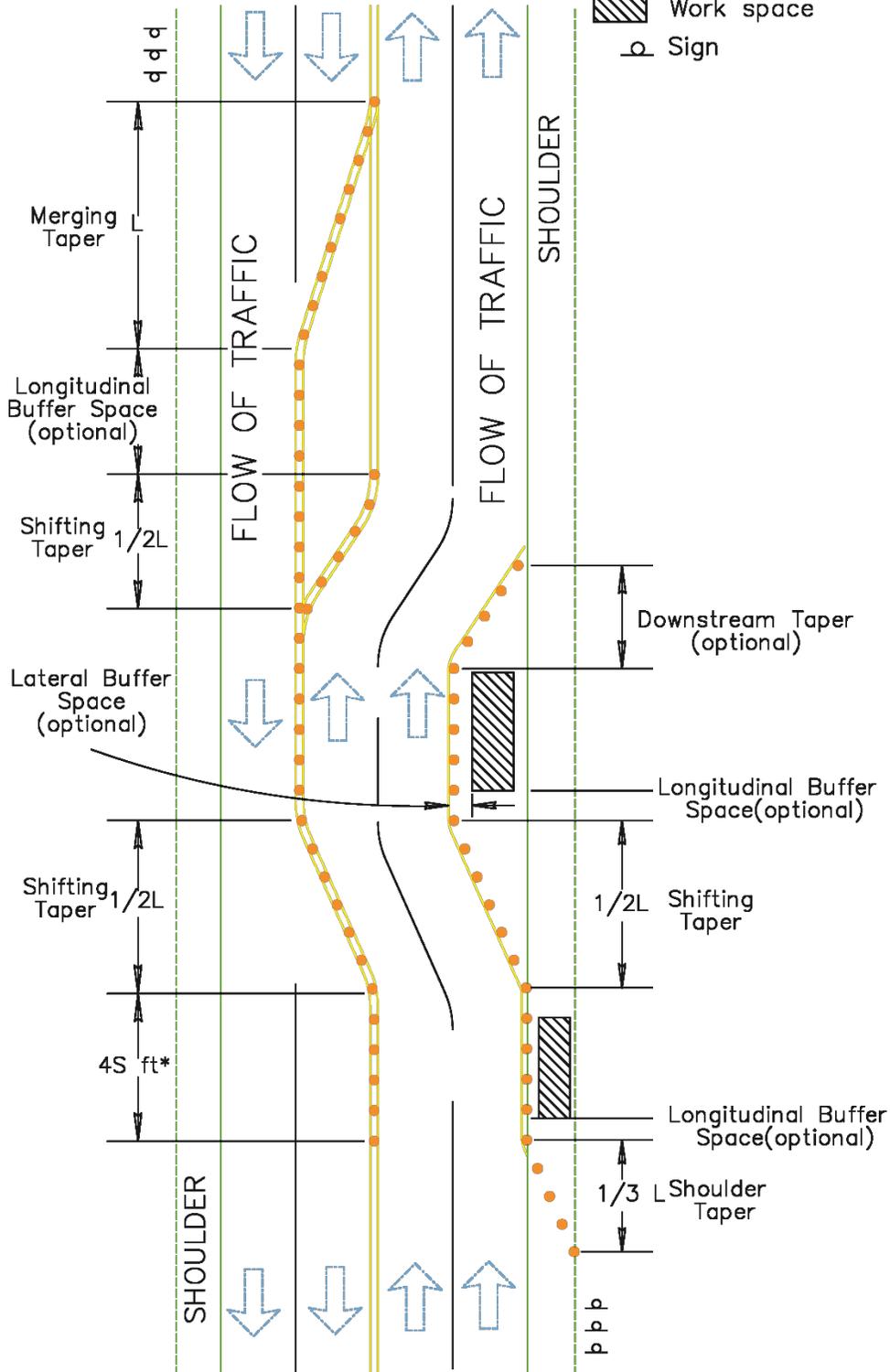
| <u>REFERENCES</u> | |
|---|--|
| US Department of Transportation | |
| <ul style="list-style-type: none"> • Federal Highway Administration <ul style="list-style-type: none"> • Manual on Uniform Traffic Control Devices (MUTCD) 2009 Edition | |
| New Jersey Department of Transportation | |
| <ul style="list-style-type: none"> • NJDOT Traffic Engineering • NJDOT Employee Safety • NJDOT Work Zone Task Force | |

TYPES OF TAPERS AND NUMBER OF CONES CHART

(Reference MUTCD 6C.01 – 6C.15)

LEGEND

-  Direction of travel
-  Channelizing Device
-  Work space
-  Sign



* S = speed in mph

TYPES OF TAPERS AND NUMBER OF CONES CHART

(Reference MUTCD 6C.01 – 6C.15)

Tapers (MUTCD 6C.08)

- 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 length 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.
- The appropriate taper length (L) should be determined using the criteria shown in the Taper length and number of cones table.
- The maximum distance in feet between devices in a taper should not exceed 1.0 times the speed limit in mph. For nighttime work the distance in feet between devices should be decreased to enhance the visibility in the traffic control zone.

Where:

- **L = taper length in feet**
- **W = width of offset in feet**
- **S = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in mph**

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 an adjacent lane before the downstream end of the transition.

Shifting Taper is used when a lateral shift is needed. When more space is available, a longer than minimum taper distance can be beneficial. Changes in alignment can also be accomplished by using horizontal curves designed for normal highway speeds. A shifting taper should have a length of approximately $1/2 L$.

Shoulder Taper might 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. In these instances, the same type, but abbreviated, closure procedures used on a normal portion of the roadway can be used. If used, shoulder tapers should have a length of approximately $1/3 L$.

Downstream Taper might be useful in termination areas to provide a visual cue to the driver that access is available back into the original lane or path that was closed. When used, a downstream taper should have a length of approximately 100 feet per lane with devices placed at a spacing of approximately 20 feet.

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. (Two Lane Road Using Flagger)

TYPES OF TAPERS AND NUMBER OF CONES CHART

(Reference MUTCD 6C.01 – 6C.15)

Formulas for Determining Taper Length

- If the speed is 40 mph or less $L = W \times S \times S$ divided by 60 equals length of taper.
- If the speed is 45 mph or more $L = W \times S$
- Formula for determining shifting Taper Length, Merging Taper length divide by 2
- Formula for determining a Shoulder Taper Length, Merging Taper length divide by 3
- Downstream Taper 100 feet per lane
- One – Lane Two Way Taper should have a minimum length of 50 feet and a maximum length of 100 feet with cone spacing approximately 20 – feet.
- The maximum distance in feet between devices in a taper should not exceed 1.0 times the speed limit in mph.

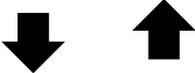
| MERGING TAPER LENGTH AND NUMBER OF CONES | | | | | | | | |
|--|--------------|------------|--------------|------------|--------------|------------|--------------|------------|
| Speed | 25 MPH | | 30 MPH | | 35 MPH | | 40 MPH | |
| Lane Width | Taper Length | # of Cones |
| 10 | 120' | 7 | 160' | 9 | 220' | 12 | 280' | 15 |
| 11 | 120' | 7 | 180' | 10 | 240' | 13 | 300' | 16 |
| 12 | 140' | 8 | 180' | 10 | 260' | 14 | 320' | 17 |

| Speed | 45 MPH | | 50 MPH | | 55 MPH | | 65 MPH | |
|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|
| Lane Width | Taper Length | # of Cones |
| 10 | 460' | 24 | 500' | 26 | 560' | 29 | 660' | 34 |
| 11 | 500' | 26 | 560' | 29 | 620' | 32 | 720' | 37 |
| 12 | 540' | 28 | 600' | 31 | 660' | 34 | 780' | 40 |

| SHOULDER TAPER LENGTH AND NUMBER OF CONES | | | | | | | | |
|---|--------------|------------|--------------|------------|--------------|------------|--------------|------------|
| Speed | 25 MPH | | 30 MPH | | 35 MPH | | 40 MPH | |
| Lane Width | Taper Length | # of Cones |
| 1 - 5 | 20' | 3 | 20' - 40' | 3 | 20' - 40' | 3 | 40' - 140' | 3 - 5 |
| 6 - 11 | 40' | 3 | 40' - 60' | 3 - 4 | 40' - 80' | 3 - 5 | 60' - 100' | 3 - 5 |
| 12 | 60' | 4 | 80' | 5 | 100' | 6 | 120' | 7 |

| Speed | 45 MPH | | 50 MPH | | 55 MPH | | 65 MPH | |
|------------|--------------|------------|--------------|------------|--------------|------------|--------------|------------|
| Lane Width | Taper Length | # of Cones |
| 1 - 5 | 20' - 80' | 3 - 5 | 20' - 100' | 3 - 6 | 20' - 100' | 3 - 6 | 40' - 120' | 3 - 7 |
| 6 - 11 | 100' - 180' | 6 - 10 | 100' - 200' | 6 - 11 | 120' - 220' | 7 - 12 | 140' - 240' | 8 - 13 |
| 12 | 180' | 10 | 200' | 11 | 220' | 12 | 260' | 14 |

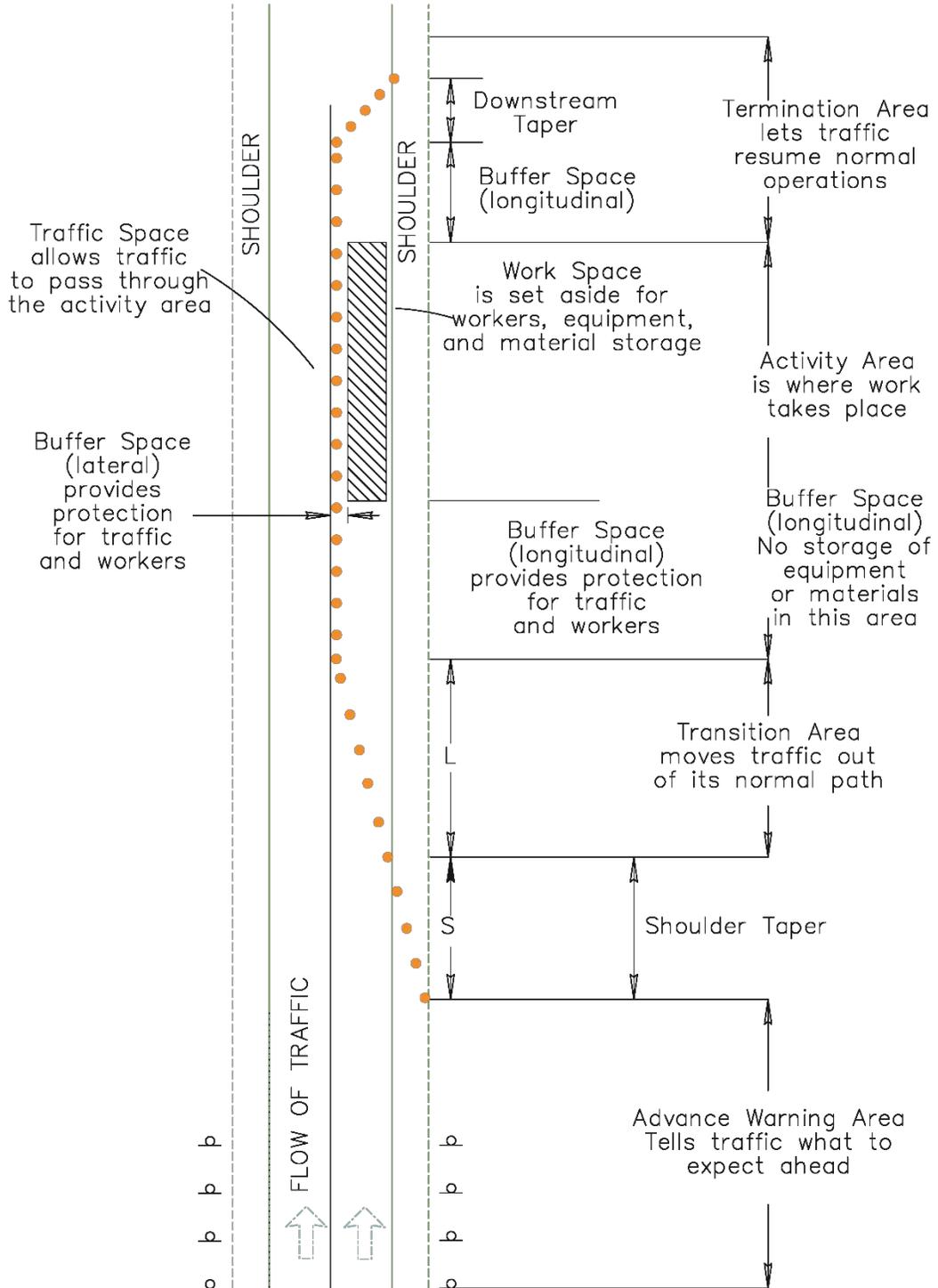
LEGEND

| Symbol | Description |
|---|--|
|  | Arrow Board |
|  | Truck Mounted Arrow Panel |
|  | Variable Message Sign (VMS) |
|  | Channelizing device (cone/drum) |
|  | Direction of traffic |
|  | Flagger Symbol |
|  | Advanced Warning Sign |
|  | Shadow Vehicle |
|  | Sign (shown facing traffic) |
|  | Surveyor |
|  | Truck Tailgate Mounted Sign |
|  | Truck Mounted Attenuator |
|  | Workspace |
|  | Work Vehicle |

PARTS OF A TEMPORARY TRAFFIC CONTROL ZONE

LEGEND

-  Direction of travel
-  Channelizing Device
-  Work space
-  Sign



PARTS OF A TEMPORARY TRAFFIC CONTROL ZONE

Advance Warning Area

1. The advance warning area is the section of highway where road users are informed about the upcoming work zone or incident area.
2. The advance warning area may vary from a single sign or high intensity rotating, flashing, oscillating, or strobe lights on a vehicle to a series of signs in advance of the TTC zone activity area.

Shoulder Taper

1. A shoulder taper might 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. In these instances, the same type, but abbreviated, closure procedures used on a normal portion of the roadway can be used.

Transition Area

1. The transition area is that section of highway where road users are redirected out of their normal path. Transition areas usually involve strategic use of tapers, which because of their importance are discussed separately in detail.
2. When redirection of the road users' normal path is required, they shall be directed from the normal path to a new path.

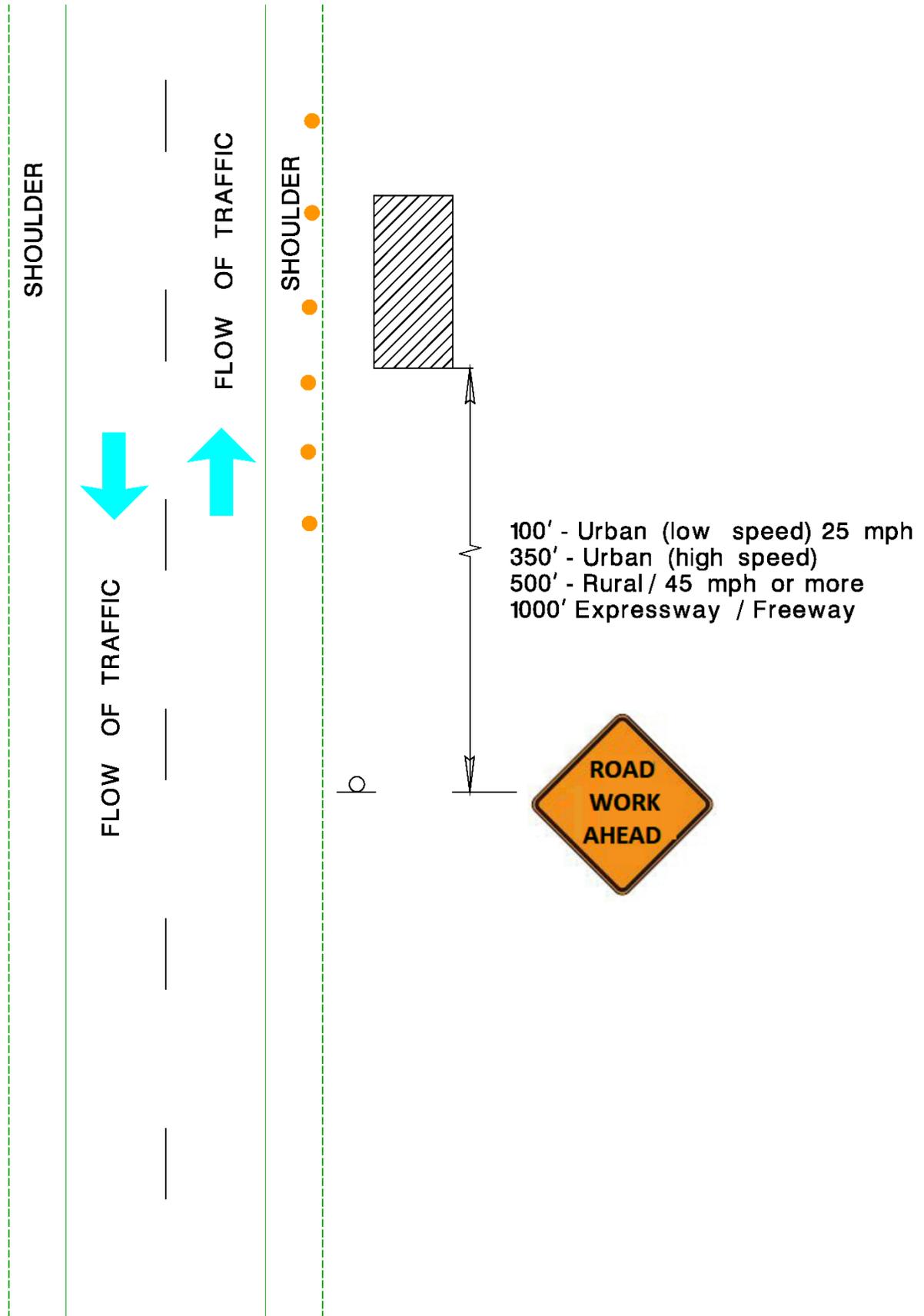
Activity Area

1. The activity area is the section of the highway where the work activity takes place. It is comprised of the workspace, the traffic space, and the buffer space.
2. The workspace is that portion of the highway closed to road users and set aside for workers, equipment, and material, and a shadow vehicle if one is used upstream. Workspaces are usually delineated for road users by channelizing devices or, to exclude vehicles and pedestrians, by temporary barriers.

Termination Area

1. The termination area is the section of the highway where road users are returned to their normal driving path. The termination area extends from the downstream end of the work area to the last TTC device such as END ROAD WORK signs, if posted.

WORK BEYOND THE SHOULDER



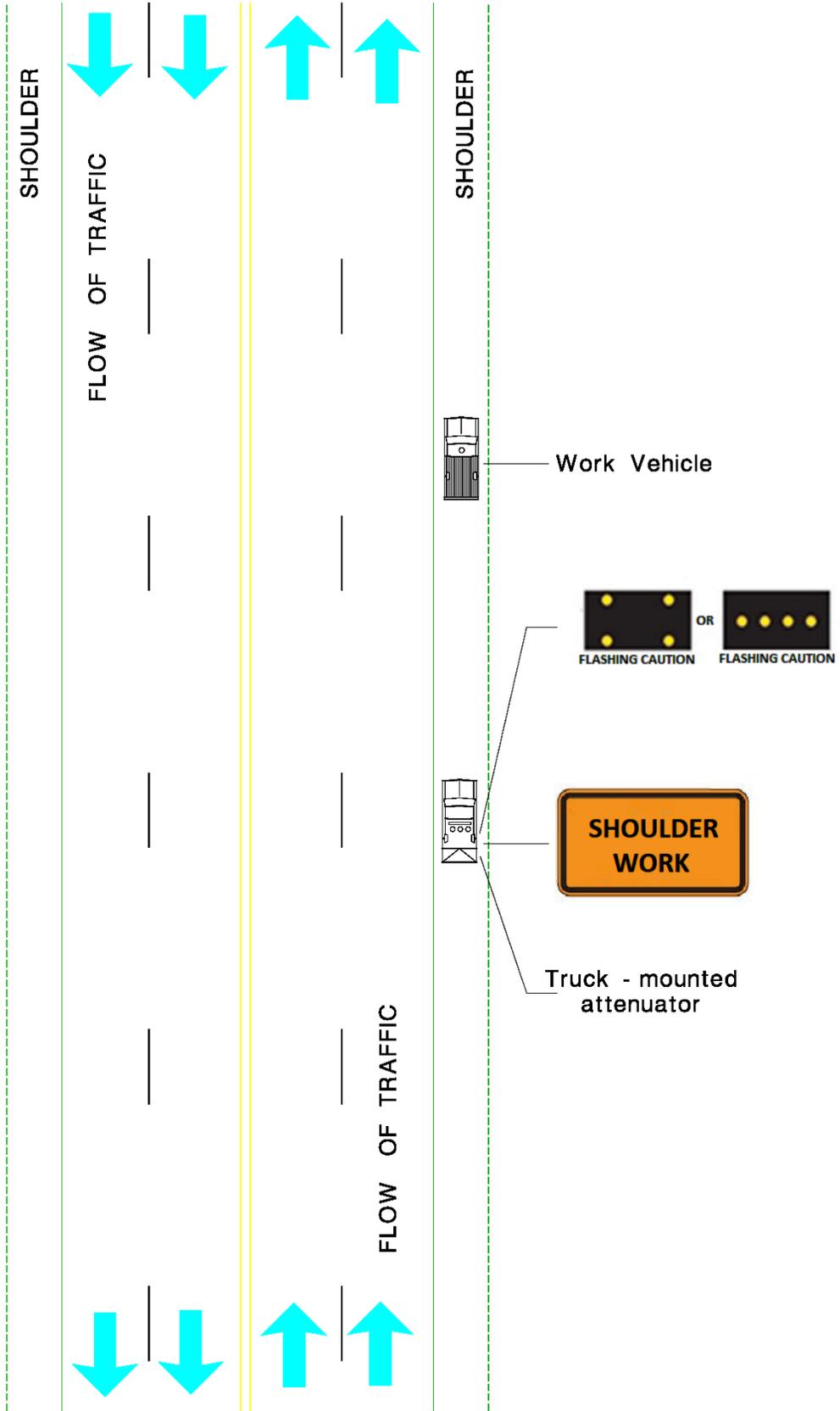
WORK BEYOND THE SHOULDER

1. If the workspace is in the median of a divided highway, an advance warning sign should be placed on the left side of the directional roadway.
2. Vehicle hazard warning signals may be used to supplement, but not replace, high intensity rotating, flashing, oscillating, or strobe lights.
3. The **ROAD WORK AHEAD** sign may be replaced with other appropriate signs such as the **SHOULDER WORK** sign. The **SHOULDER WORK** sign may be used for work adjacent to the shoulder.
4. The advance warning sign may be omitted where the workspace is behind a barrier, more than 24 inches behind the curb, or 15 feet or more from the edge of any roadway.
5. For short duration or mobile operation, all signs and channelizing devices may be eliminated if a vehicle with activated high intensity rotating, flashing, oscillating, or strobe lights are used.
6. Recommended Advance Warning sign spacing:
 - Urban (low speed) - 100 feet
 - Urban (high speed) - 350 feet
 - Rural / 45 mph or more - 500 feet
 - Expressway / Freeway - 1,000 feet

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

- **Intermediate Term Stationary:** Is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
- **Short-Term Stationary:** Is daytime work that occupies a location for more than 1 hour within a single daylight period.
- **Short Duration:** Is work that occupies a location up to 1 hour.
- **Mobile Operation:** Is work that moves intermittently or continuously.

SHORT DURATION OR MOBILE OPERATION ON THE SHOULDER OF A MULTI-LANE ROAD



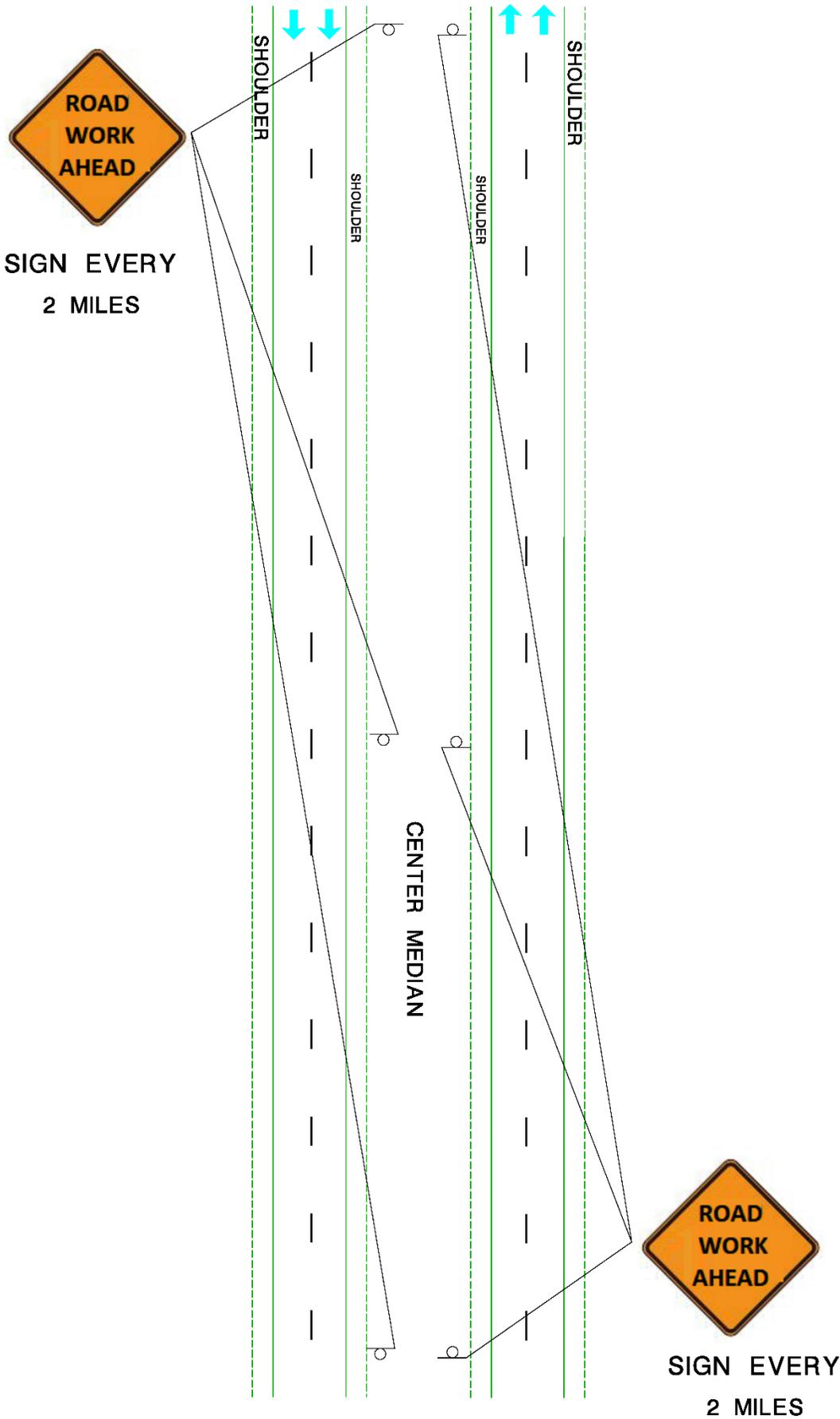
SHORT DURATION OR MOBILE OPERATION ON THE SHOULDER OF A MULTI-LANE ROAD

1. If an arrow board is used for an operation on the shoulder, the caution mode shall be used. Arrow board shall, as a minimum, be Type B, with a size of 60 x 30 inches.
2. Vehicle hazard warning signals may be used to supplement, but not replace, high intensity rotating, flashing, oscillating, or strobe lights.
3. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.
4. In those situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 5 miles.
5. Advance warning signs may be omitted for short duration or mobile operations if the Shadow Vehicle displays a high intensity rotating, flashing, oscillating, or strobe lights and an orange tailgate sign attached to the rear of the vehicle.
6. An arrow board shall be used when a freeway lane is closed.
7. A Shadow Vehicle with a TMA shall be used if the speed limit is 45 MPH or greater.

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

- **Intermediate Term Stationary:** Is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
- **Short-Term Stationary:** Is daytime work that occupies a location for more than 1 hour within a single daylight period.
- **Short Duration:** Is work that occupies a location up to 1 hour.
- **Mobile Operation:** Is work that moves intermittently or continuously.

MOBILE OPERATION IN THE CENTER MEDIAN



MOBILE OPERATION IN THE CENTER MEDIAN

1. For workspaces in the center median of a divided highway, an advance warning sign should be placed on the left side of the directional roadway.
2. The advance warning sign may be omitted where the workspace is behind a barrier, more than 24 inches behind the curb, or 15 feet or more from the edge of any roadway.
3. For short duration or mobile operation, all signs and channelizing devices may be eliminated if a vehicle with activated high intensity rotating, flashing, oscillating, or strobe lights are used.
4. Vehicle hazard warning signals may be used to supplement, but not replace, high intensity rotating, flashing, oscillating, or strobe lights.
5. If a center median work operation interferes with traffic, lane closures should be implemented.

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

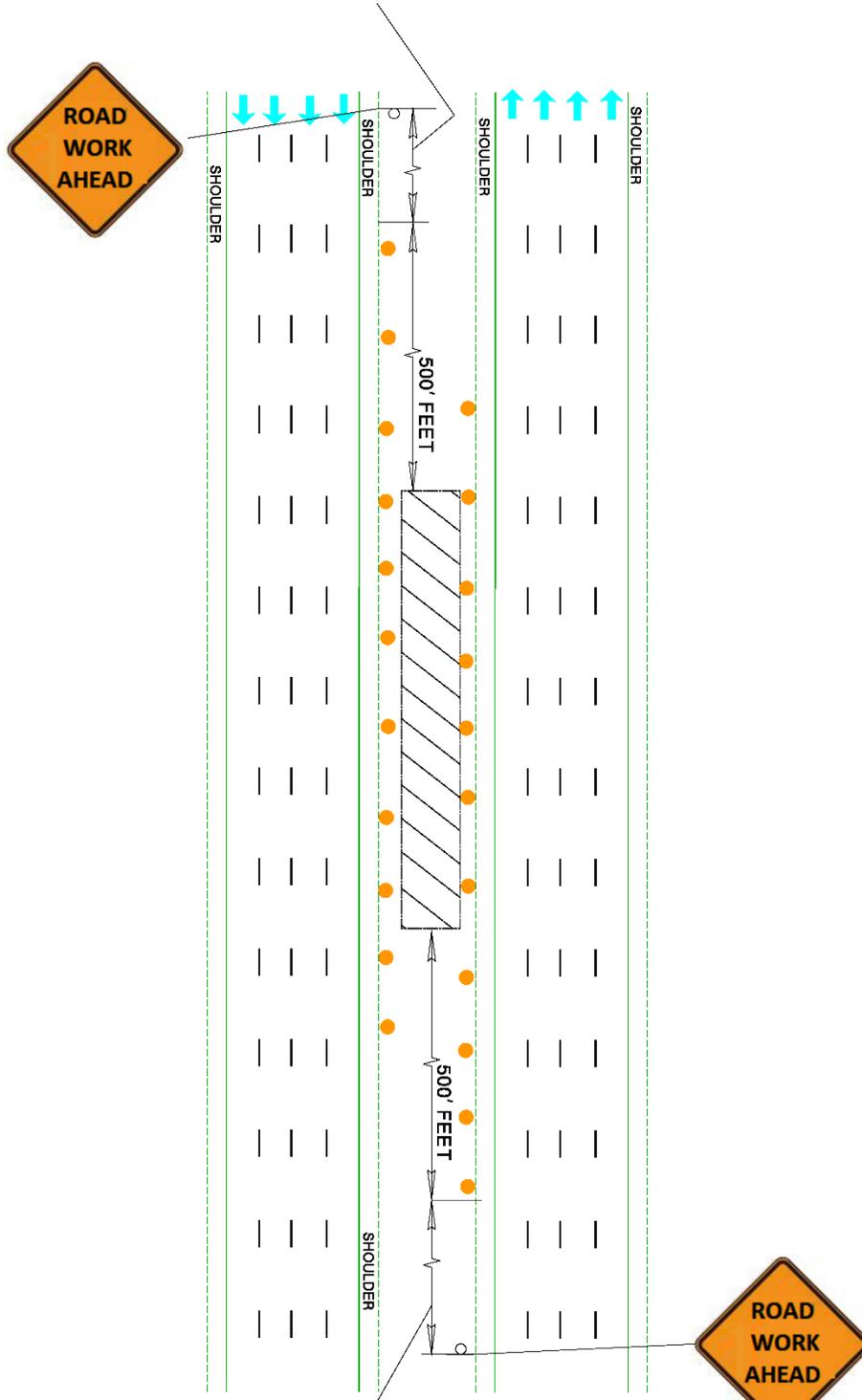
- **Intermediate term stationary:** Is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
- **Short-term stationary:** Is daytime work that occupies a location for more than 1 hour within a single daylight period.
- **Short duration:** Is work that occupies a location up to 1 hour.
- **Mobile Operation:** Is work that moves intermittently or continuously.

SHORT-TERM STATIONARY OPERATION IN CENTER MEDIAN

350'- URBAN (high speed)

500'- RURAL / 45 mph or more

1000'- EXPRESSWAY / FREEWAY



350'- URBAN (high speed)

500'- RURAL / 45 mph or more

1000'- EXPRESSWAY / FREEWAY

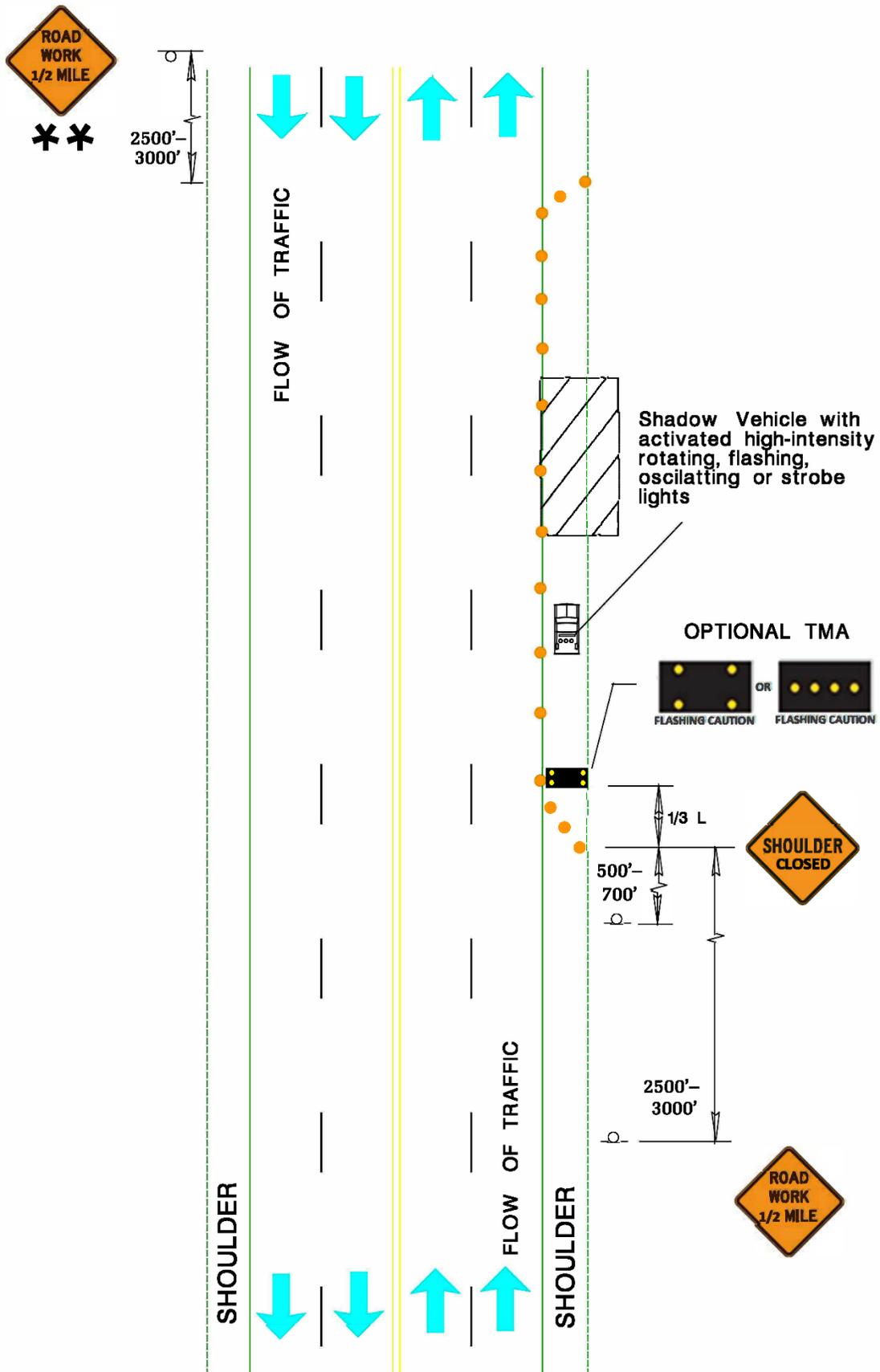
SHORT-TERM STATIONARY OPERATION IN CENTER MEDIAN

1. For workspaces in the center median of a divided highway, an advance warning sign should be placed on the left side of the directional roadway.
2. Vehicle hazard warning signals may be used to supplement, but not replace, high intensity rotating, flashing, oscillating, or strobe lights.
3. The workspace is that portion of the highway closed to road users and set aside for workers, equipment, and material.
4. If center median work operation interferes with opposing traffic. Left lane closures should be set up.
5. TTC should be used through the use of advance warning signs and channelizing devices if the work in the median of a divided highway is within 15 feet from the edge of the traveled roadway for either direction of travel.
6. If working in the median of a divided highway, the MUTCD chapter 6D, section 6F.74 and 6G.05 contains additional information regarding the necessary steps to follow when pedestrian or bicycle facilities are affected by the worksite.

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

- **Intermediate term stationary:** Is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour.
- **Short-term stationary:** Is daytime work that occupies a location for more than 1 hour within a single daylight period.
- **Short duration:** Is work that occupies a location up to 1 hour.
- **Mobile Operation:** Is work that moves intermittently or continuously.

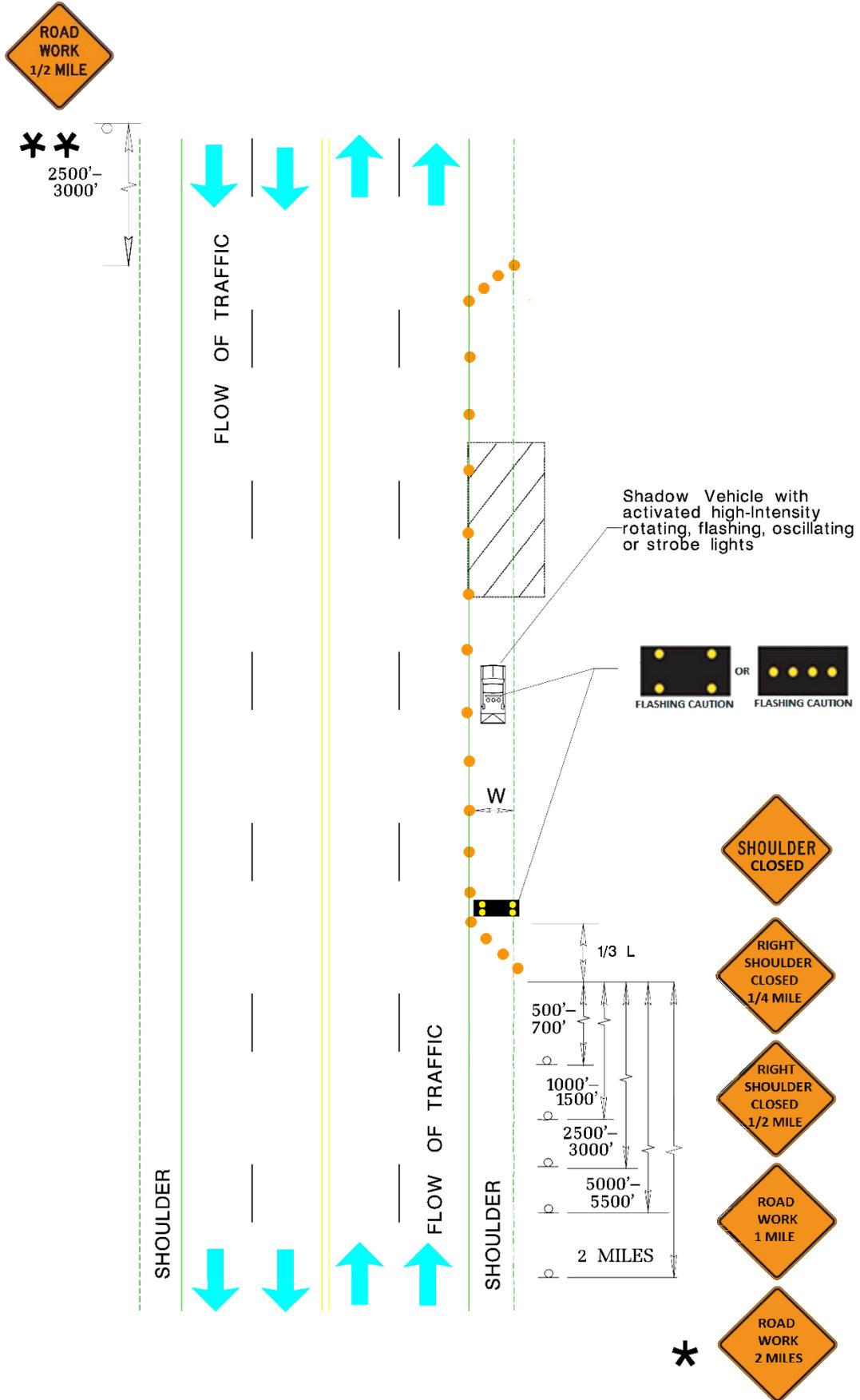
WORK AREA IN SHOULDER FOR SPEED LIMIT LESS THAN 45 MPH



WORK AREA IN SHOULDER **FOR SPEED LIMIT LESS THAN 45 MPH**

1. A minimum of one advance warning sign shall be used when a paved shoulder, having a width of 8 feet or more are closed. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the workspace and direct vehicular traffic to remain within the traveled way.
2. A **SHOULDER WORK** sign should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.
3. The **SHOULDER WORK AHEAD** sign on an intersecting roadway may be omitted where drivers emerging from this roadway will encounter another advance warning sign prior to the activity area.
4. Use a TMA with a Shadow Vehicle for Speed Limits of 45 MPH or greater.
5. Vehicle hazard warning signals may be used to supplement, but not replace, high intensity rotating, flashing, oscillating, or strobe lights.
6. If an arrow board is used for an operation on the shoulder, the caution mode shall be used.
7. ** Use the **ROAD WORK 1/2 MILE** sign only if highway is undivided.

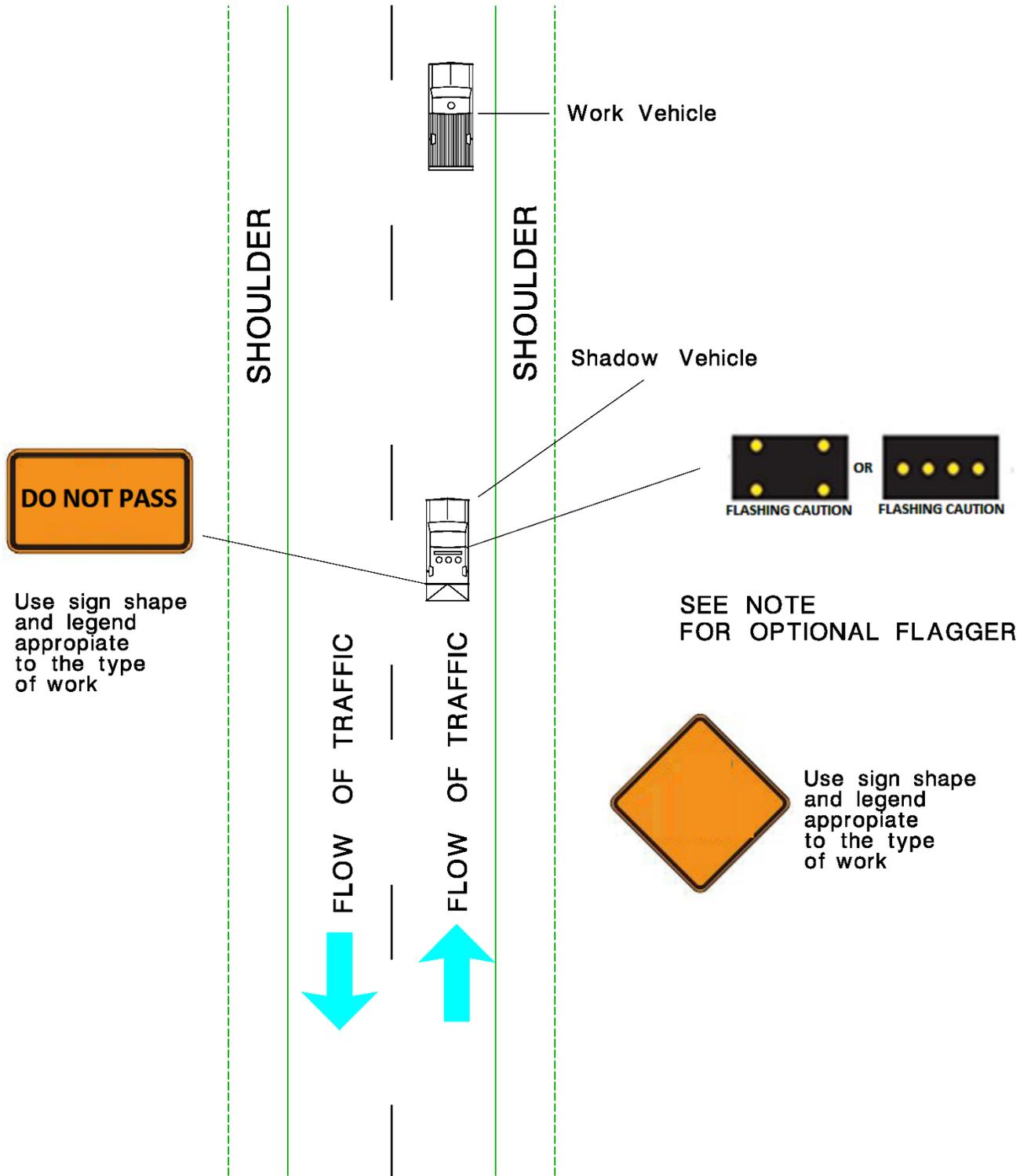
WORK AREA IN SHOULDER FOR SPEED LIMIT 45 MPH OR GREATER



WORK AREA IN SHOULDER FOR SPEED LIMIT 45 MPH OR GREATER

1. A minimum of one advance warning sign shall be used when a paved shoulder, having a width of 8 feet or more are closed. In addition, channelizing devices shall be used to close the shoulder in advance to delineate the beginning of the workspace and direct vehicular traffic to remain within the traveled way.
2. A **SHOULDER WORK AHEAD** sign should be placed on the left side of the roadway for a divided or one-way street only if the left shoulder is affected.
3. The **SHOULDER WORK AHEAD** sign on an intersecting roadway may be omitted where drivers emerging from this roadway will encounter another advance warning sign prior to the activity area.
4. Use a TMA with a Shadow Vehicle for speed limit of 45 MPH or greater.
5. Truck-mounted attenuators shall be energy-absorbing devices attached to the rear of shadow trailers or trucks. If used, the shadow vehicle with the attenuator shall be in advance of the work area, workers, or equipment to reduce the severity of rear-end crashes from errant vehicles.
6. Vehicle hazard warning signals may be used to supplement, but not replace, high intensity rotating, flashing, oscillating, or strobe lights.
7. **SHOULDER CLOSED** signs should be used on limited-access highways where there is no opportunity for disabled vehicles to pull off the roadway.
8. * Use the **ROAD WORK 2 MILES** sign in addition to the **ROAD WORK 1 MILE** sign when the speed is 65 MPH.
9. ** Use **ROAD WORK 1/2 MILE** only if highway is undivided.

2 LANE ROAD MOBILE OPERATION



2 LANE ROAD

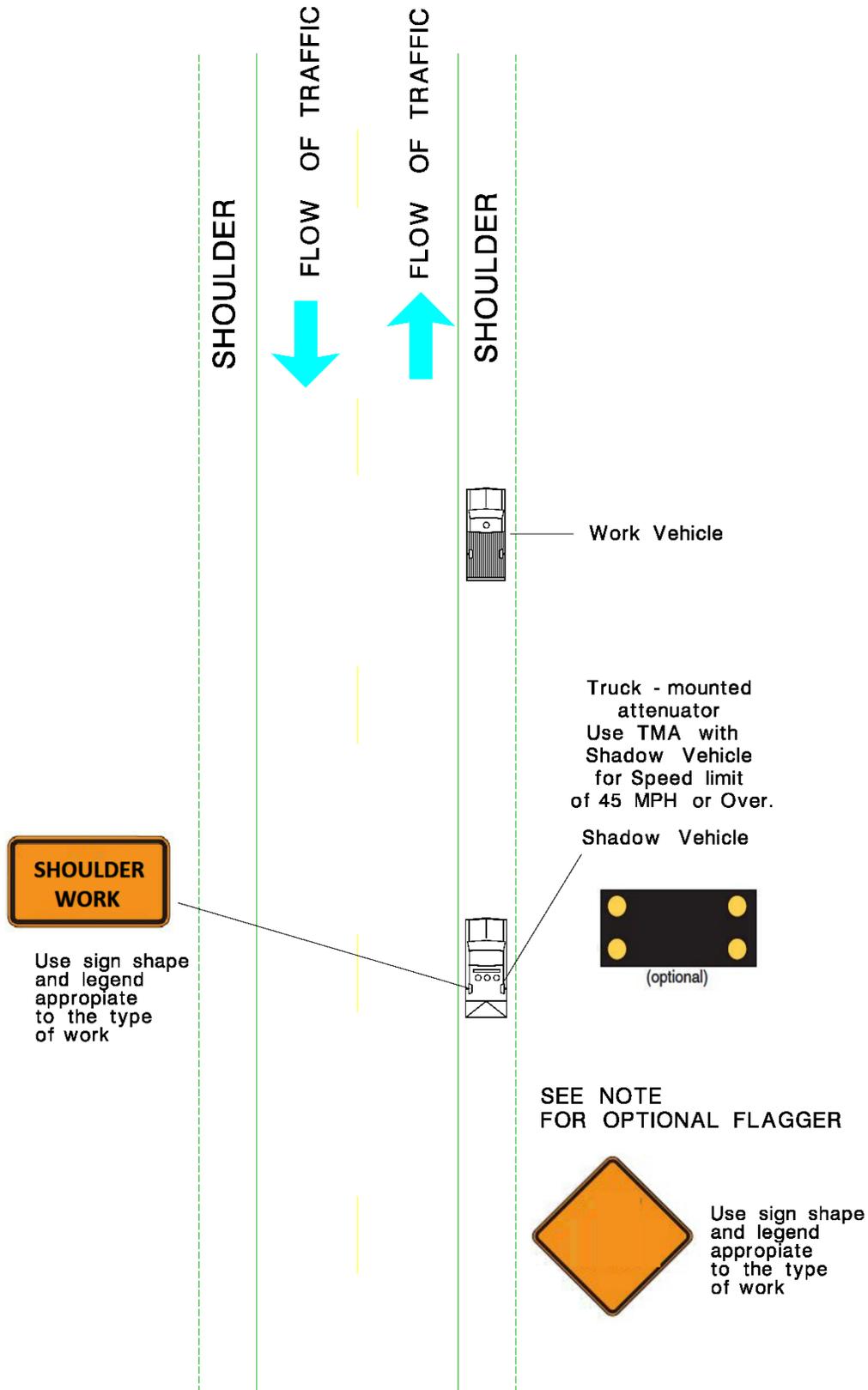
MOBILE OPERATION

1. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.
2. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
3. Vehicle hazard warning signals may be used to supplement, but not replace, high intensity rotating, flashing, oscillating, or strobe lights.
4. An arrow board shall be used in the caution mode.
5. The shadow vehicle should slow down in advance of vertical or horizontal curves that restrict sight distance. The distance between the work and shadow vehicles may vary according to terrain and other factors.
6. Additional shadow vehicles may be used to warn and reduce the speed of oncoming and/or opposing vehicular traffic.
7. A mobile operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH, the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacture.
8. If the work and shadow vehicles cannot pull over to allow vehicular traffic to pass frequently, a **DO NOT PASS** sign may be placed on the rear of the vehicle blocking the lane.
9. Ground mounted advance warning signs similar to that on the shadow vehicle may be used to provide additional advance warning, where speed and/or volumes are high.

NOTE: Mobile Operation on a 2 Lane Road Using Optional Flaggers

10. The distance between **ROAD WORK AHEAD** signs should not exceed approximately 2 miles.
11. Where feasible, well defined end points (intersections, major driveways, city limits, etc.) should be used to establish the limits of the work zone.
12. The flagger symbol warning signs should be repositioned periodically as the operation moves. These signs should be kept within approximately 500 feet to 1500 feet of each Flaggers.
13. The flagger symbol warning sign should be positioned so that the flagger can see the back of the warning signs. This will assure the flagger's visibility of approaching traffic.
14. For low-speed roads the **BE PREPARED TO STOP** sign may be eliminated.

2 LANE ROAD SHORT DURATION OR MOBILE OPERATION ON THE SHOULDER



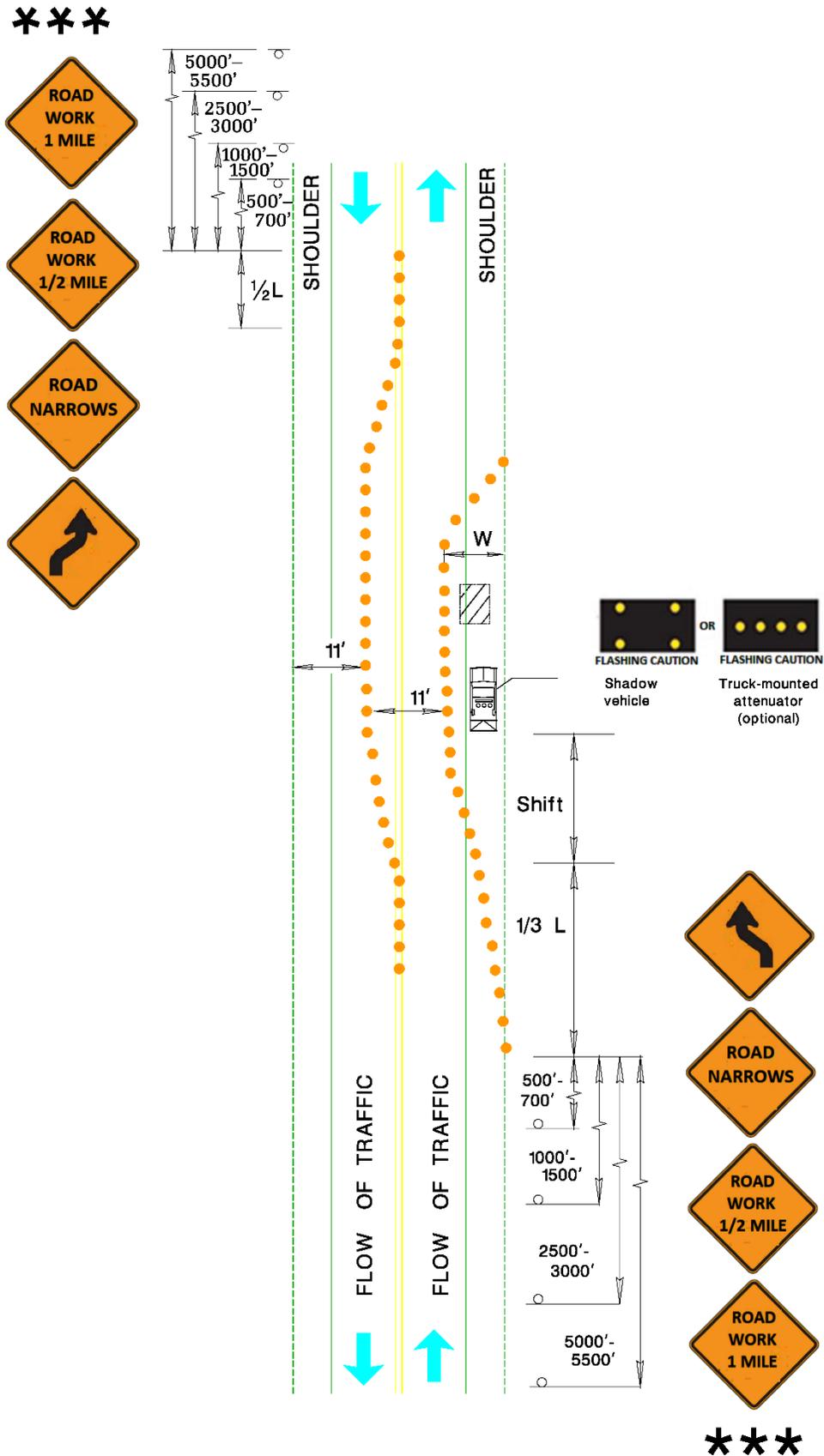
2 LANE ROAD **SHORT DURATION OR MOBILE OPERATION** **ON THE SHOULDER**

1. If an arrow board is used for an operation on the shoulder, the caution mode shall be used. Arrow board shall, as a minimum, be Type B, with a size of 60 x 30 inches.
2. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.
3. In situations where multiple work locations within a limited distance make it practical to place stationary signs, the distance between the advance warning sign and the work should not exceed 5 miles.
4. The **ROAD WORK NEXT XX MILES** sign may be used instead of the **ROAD WORK AHEAD** sign if the work locations occur over a distance of more than 2 miles.
5. Advance warning signs may be omitted for short duration or mobile operations if the Shadow Vehicle displays a high intensity rotating, flashing, oscillating, or strobe lights and an orange tailgate sign attached to the rear of the vehicle.
6. Vehicle hazard warning signals may be used to supplement, but not replace, high intensity rotating, flashing, oscillating, or strobe lights.
7. A mobile operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH, the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacture.

NOTE: Mobile Operation on a 2 Lane Road Using Optional Flaggers

8. The distance between **ROAD WORK AHEAD** signs should not exceed approximately 2 miles.
9. Where feasible, well defined end points (intersections, major driveways, city limits, etc.) should be used to establish the limits of the work zone.
10. The flagger symbol warning signs should be repositioned periodically as the operation moves. These signs should be kept within approximately 500 feet to 1500 feet of each Flaggers.
11. The flagger symbol warning sign should be positioned so that the flagger can see the back of the warning signs. This will assure the flagger's visibility of approaching traffic.
12. For low-speed roads the **BE PREPARED TO STOP** sign may be eliminated.

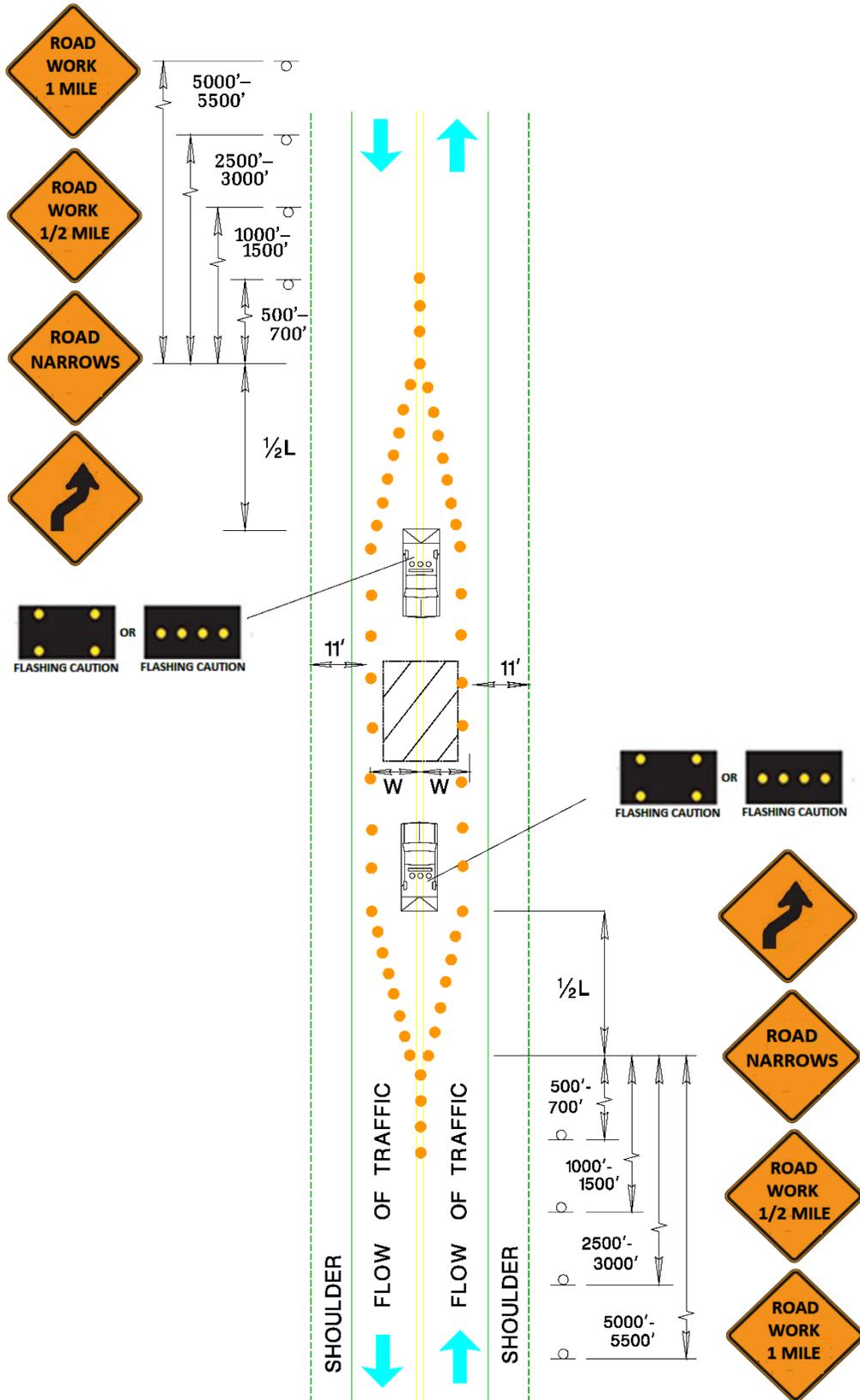
2 LANE ROAD SHOULDER WORK WITH MINOR ENCROACHMENT



2 LANE ROAD
SHOULDER WORK WITH MINOR
ENCROACHMENT

1. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.
2. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
3. A half length taper shall be used in the opposing lane traffic taper.
4. If an arrow board is used, it shall be used in the caution mode.
5. For short-term use on roadways with vehicular traffic that does not include longer and/or wider heavy commercial vehicles, a minimum lane width of 10 feet can be used.
6. Where the opposite shoulder is suitable for carrying vehicular traffic and is of adequate width, lanes may be shifted by use of closely-spaced channelizing devices, provided that the minimum lane width of 10 feet is maintained.
7. The truck-mounted attenuator may be omitted if a taper and channelizing devices are used. A shadow vehicle shall be used.
8. Use a TMA with Shadow Vehicle for Speed limit of 45 MPH or greater.
9. *** Install the **ROAD WORK 1 MILE** sign for roads with a posted speed limit of 45 MPH or greater.

2 LANE ROAD WORK AREA IN CENTER OF ROAD

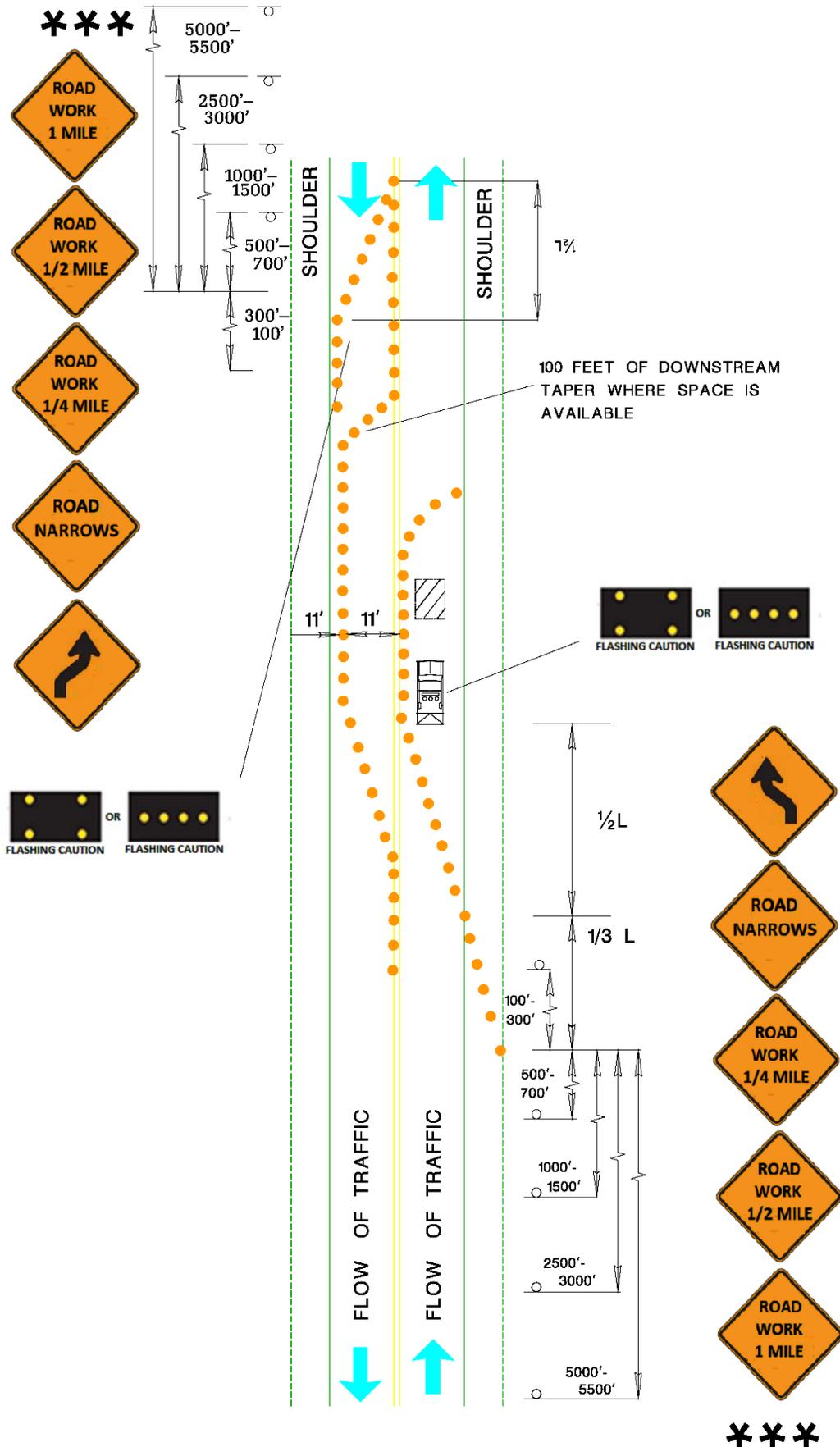


2 LANE ROAD

WORK AREA IN CENTER OF ROAD

1. The lanes on either side of the center workspace should have a minimum width of 11 feet as measured from the near edge of the channelizing devices to the edge of the pavement or the outside edge of the paved shoulder.
2. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.
3. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
4. Use a TMA with a Shadow Vehicle for Speed limits of 35 MPH or over in both directions.
5. Shift signage is mandatory.
6. For short-term use on roadways with vehicular traffic, that does not include longer and/or wider heavier commercial vehicles, a minimum lane width of 10 feet can be used.
7. A half-length taper shall be used for this application.
8. For night work applications, the work area shall be illuminated.
9. A **BE PREPARED TO STOP** sign may be added to the sign series.
10. *** Install the **ROADWORK 1 MILE** sign for roads with a posted speed limit of 45 MPH or greater.

2 LANE ROAD WORK AREA IN ONE LANE

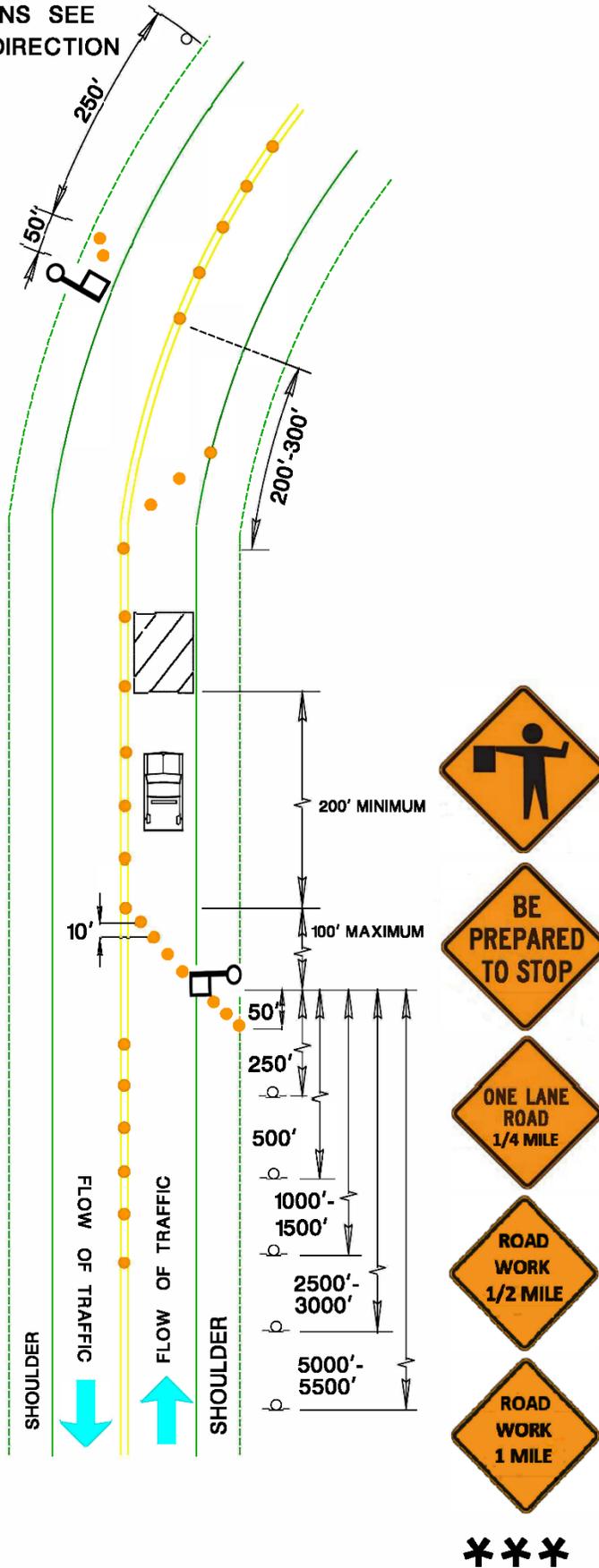


2 LANE ROAD WORK AREA IN ONE LANE

1. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.
2. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
3. When a side road intersects the highway within the TTC zone, additional TTC devices shall be placed as needed.
4. The **SHIFT** sign is mandatory for this lane closure.
5. When paved shoulders having a width of 8 feet or more are closed, channelizing devices should be used to close the shoulder in advance of the shift taper to direct vehicular traffic to remain within the traveled way.
6. A half-length taper shall be used for this application.
7. For nighttime operations, the work area shall be illuminated.
8. Use a TMA with a Shadow Vehicle for speed limit of 35 MPH and greater.
9. Cones placed on the center line can be extended as needed if vehicular traffic is trying to shift over too soon.
10. When shoulders cannot hold traffic or if they are less than 9 to 10 feet in width, a flagging operation set up will be required.
11. *** Install the **ROAD WORK 1 MILE** sign for roads with a posted speed limit of 45 MPH or greater.

LANE CLOSURE ON A 2-LANE ROAD USING FLAGGERS

FOR SIGNS SEE
OTHER DIRECTION



LANE CLOSURE ON A 2-LANE ROAD

USING FLAGGERS

1. At night, flagger stations shall be illuminated, except in emergencies.
2. The buffer space should be extended so that the two-way traffic taper is placed before a horizontal (or crest vertical) curve to provide adequate sight distance for the flagger and a queue of stopped vehicles.
3. A work operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH, the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 ft. or as recommended by the Attenuator Manufacture.
4. When used, the **BE PREPARED TO STOP** sign should be located between the Flagger sign and the **ONE LANE ROAD** sign.
5. When a grade crossing exists within or upstream of the transition area and it is anticipated that queues resulting from the lane closure might extend through the grade crossing, the TTC zone should be extended so that the transition area precedes the grade crossing.
6. When a grade crossing equipped with active warning devices exists within the activity area, provisions should be made for keeping flaggers informed as to the activation status of these warning devices.
7. When a grade crossing exists within the activity area, drivers operating on the left-hand side of the normal center line should be provided with comparable warning devices as for drivers operating on the right-hand side of the normal center line.
8. Early coordination with the Railroad Company or light rail transit agency should occur before work starts.
9. A flagger or a uniformed law enforcement officer may be used at the grade crossing to minimize the probability that vehicles are stopped within 15 feet of the grade crossing, measured from both sides of the outside rails.
10. For low-volume situations with short work zones on straight roadways where the flagger is visible to road users approaching from both directions, a single flagger, positioned to be visible to road users approaching from both directions, may be used (see chapter 6E - MUTCD).
11. Flashing warning lights and/or flags may be used to call attention to the advance warning signs. A **BE PREPARED TO STOP** sign may be added to the sign series.
12. *** Install the **ROAD WORK 1 MILE** sign for roads with posted speed limits of 45 MPH or greater.
13. Stop/Slow Paddle: **Stop Sign R1-1** 24" x 24" size 8" C letters white message and border on red background, **Slow Sign W20-8** 24" x 24" 8" B Letters Black Message and border on orange background, Non-Reflective Black border. Sign faces to be Retro-reflective

LANE CLOSURE ON A 2-LANE ROAD USING FLAGGERS

Figure 6E-3. Use of Hand Signaling Devices by Flaggers

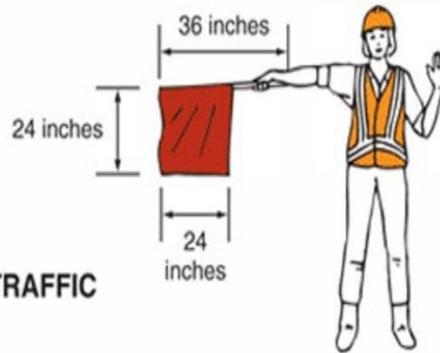
**PREFERRED METHOD
STOP/SLOW PADDLE**

**EMERGENCY SITUATIONS ONLY
RED FLAG**

Figure 6E-3. Use of Hand Signaling Devices by Flaggers

**PREFERRED METHOD
STOP/SLOW PADDLE**

**EMERGENCY SITUATIONS ON
RED FLAG**



TO STOP TRAFFIC



**TO LET
TRAFFIC PROCEED**



**TO ALERT AND
SLOW TRAFFIC**

LANE CLOSURE ON A 2-LANE ROAD

USING FLAGGERS

Figure 6E-3. Use of Hand-Signaling Devices by Flaggers

This figure illustrates the use of hand-signaling devices by flaggers.

For all illustrations, the flagger is shown dressed in an orange safety helmet and orange safety vest with two vertical white stripes that join a horizontal white stripe at the bottom of the vest.

Two methods of signaling are shown: one labeled the **PREFERRED METHOD** and another labeled **EMERGENCY SITUATIONS ONLY**. For the preferred method, the flagger is shown using an octagonal **STOP/SLOW** paddle.

The paddle width is shown as a dimension of 18 in MIN." and is shown mounted on along pole. The background of the **STOP** side of the paddle is shown as an R1-1 sign as red with a white border, and the word "**STOP**" is shown in white. The background of the **SLOW** side of the paddle is shown as a W20-8 sign as an orange diamond shape surrounded by a black area between the outside of the diamond and the octagonal edges of the sign and shows the word **SLOW** in black. For emergency situations, the flagger is shown using a square red flag with dimensions labeled as 24 x 24 inches. The flag is shown attached to a staff or handle that has an overall length, including the flag that is shown as a dimension of 36 inches.

Under the heading **PREFERRED METHOD**, three illustrations are shown:

- An illustration labeled **TO STOP TRAFFIC** shows the flagger standing facing the viewer and with the **STOP** side of the paddle facing the viewer, with the flagger's arm holding the paddle extending horizontally away from the body. The flagger is shown holding the free arm with the palm above shoulder level and facing the viewer.
- An illustration labeled **"TO LET TRAFFIC PROCEED"** shows the flagger standing facing the viewer but with the body angled slightly to the flagger's right and with the **SLOW** side of the paddle facing the viewer, with the flagger's arm holding the paddle extending horizontally away from the body. The flagger is shown motioning with the free hand swinging in an upward arc from below the horizontal arm toward the flagger's head.
- An illustration labeled **TO ALERT AND SLOW TRAFFIC** shows the flagger standing facing the viewer and with the **SLOW** side of the paddle facing the viewer, with the arm holding the paddle extending horizontally away from the body. The flagger is shown motioning up and down with the free hand, palm down.

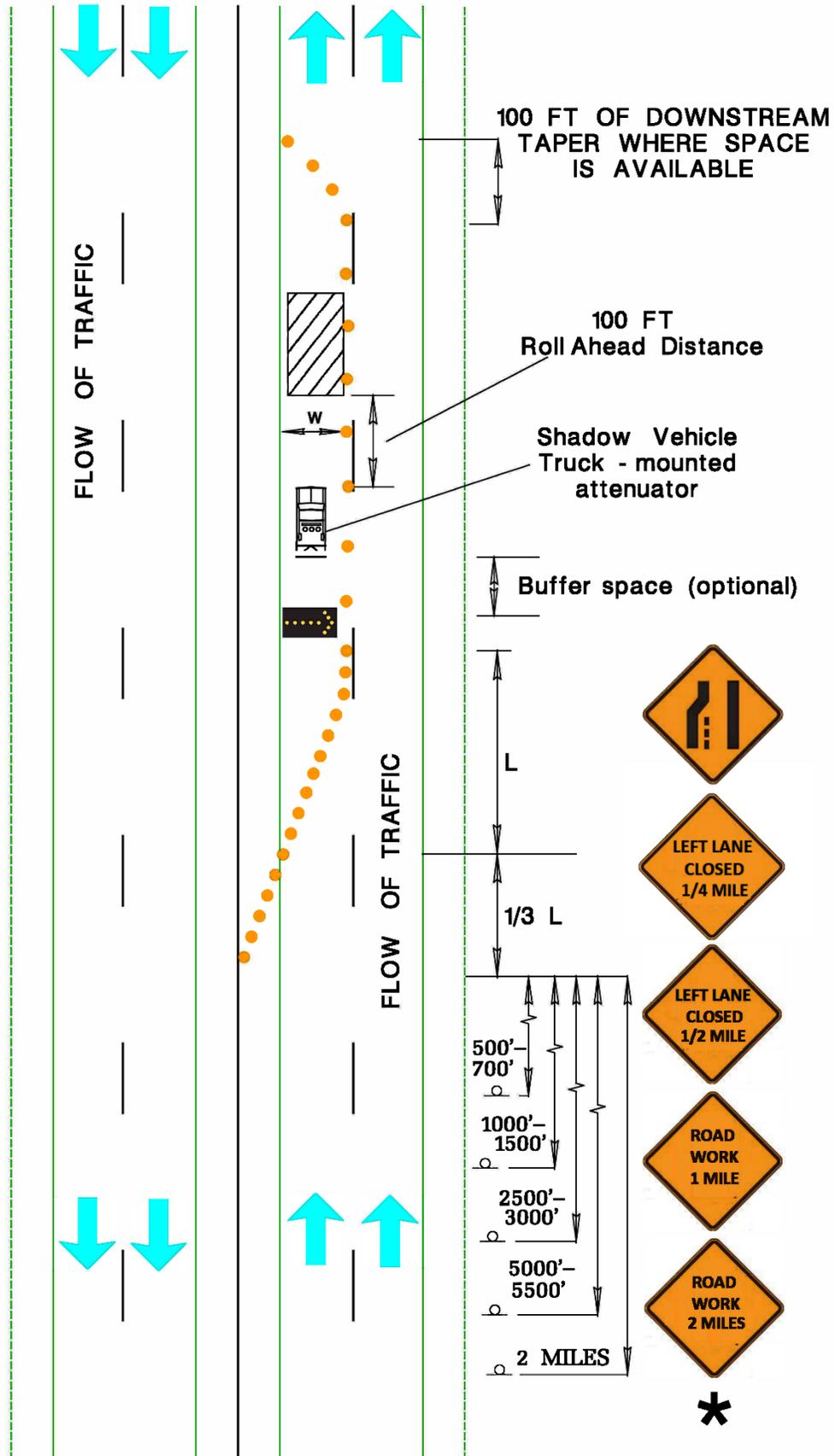
Under the heading of **EMERGENCY SITUATIONS ONLY** three illustrations are shown:

- An illustration labeled **TO STOP TRAFFIC** shows the flagger standing facing the viewer and extending the flag staff horizontally across the road users' lane, with the flag hanging down. The flagger is shown holding the free arm with the palm above shoulder level and facing the viewer.
- An illustration labeled **TO LET TRAFFIC PROCEED** shows the flagger standing facing the viewer but with the body angled slightly to the flagger's right with the flagger's arm holding the flag down next to the body. The flagger is shown motioning with the free hand swinging in an upward arc from below the horizontal arm toward the flagger's head.
- An illustration labeled **TO ALERT AND SLOW TRAFFIC** shows the flagger standing facing traffic and slowly waving the flag in a sweeping motion from shoulder level to straight down. The flagger is shown holding the free arm down at the side of the body.

SURVEYING ALONG THE CENTER LINE OF A ROAD

1. For surveying on the center line of a high-volume road, one lane shall be closed using the information illustrated in work area in center of road or lane closure using flaggers.
2. The lanes on either side of the center workspace should have a minimum width of 10 feet as measured from the near edge of the channelizing devices to the edge of the pavement or the outside edge of the paved shoulder.
3. Cones should be placed 6 to 12 inches on either side of the center line.
4. A flagger should be used to warn workers who cannot watch road users.
5. A high-level warning device may be used to protect a surveying device, such as a target on a tripod.
6. Cones may be omitted for a cross-section survey.
7. **ROAD WORK AHEAD** signs may be used in place of the **SURVEY CREW AHEAD** signs.
8. Flags may be used to call attention to the advance warning signs.
9. If the work is along the shoulder, the flagger maybe omitted.
10. For a survey along the edge of the road or along the shoulder, cones may be placed along the edge line.
11. A **BE PREPARED TO STOP** sign may be added to the sign series.
12. When used, the **BE PREPARED TO STOP** sign should be located before the flagger symbol sign.

MULTI-LANE ROAD-DIVIDED WORK AREA IN LEFT LANE

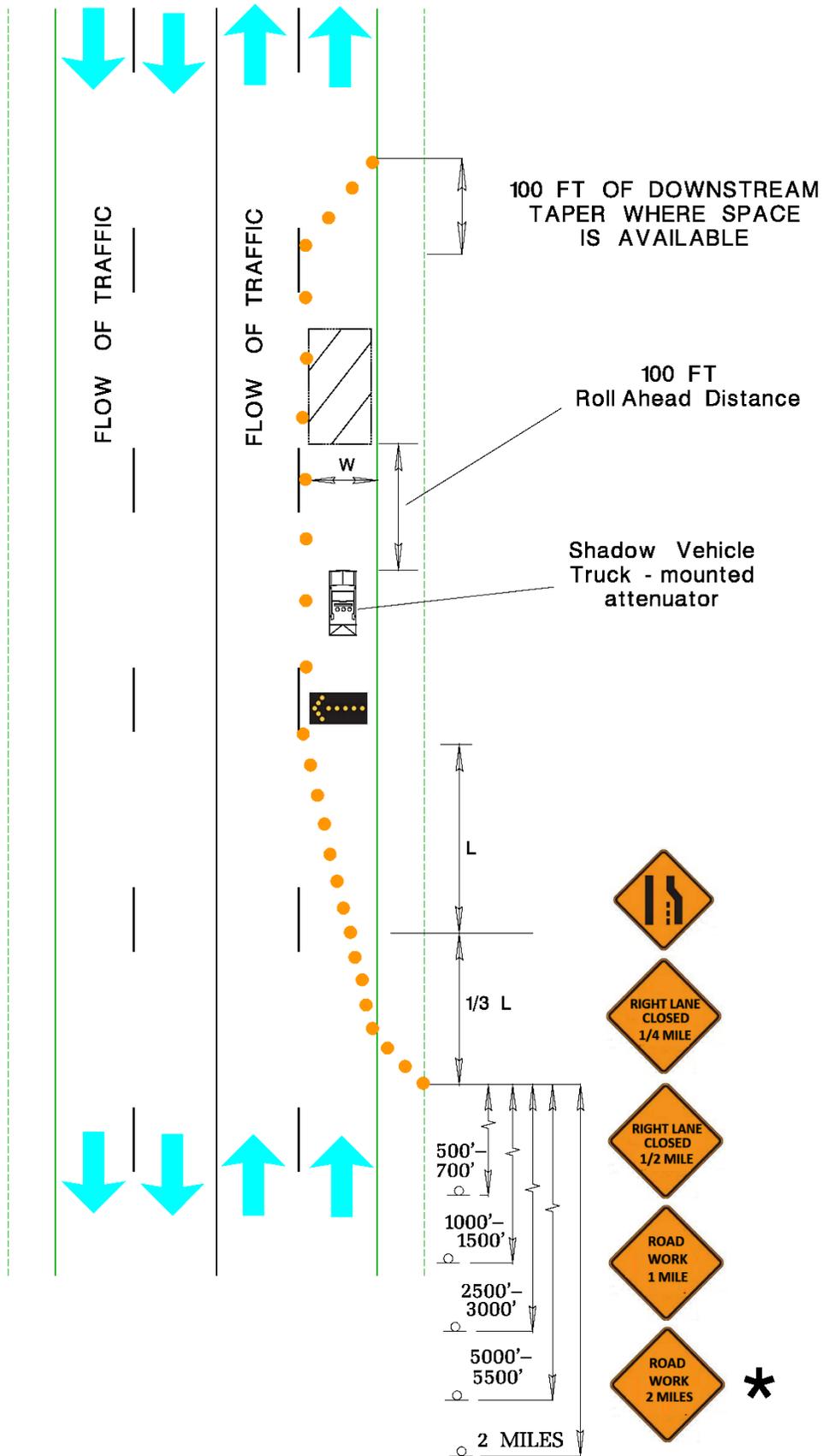


MULTI-LANE ROAD-DIVIDED **WORK AREA IN LEFT LANE**

1. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
2. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
3. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
4. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
5. The closure of the adjacent interior lane in the opposing direction may not be necessary, depending upon the activity being performed and the workspace needed for the operation.
6. A work operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH, the shadow vehicle shall be equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the attenuator Manufacture.
7. When paved shoulders having a width of eight (8) feet or more are closed, channelizing devices should be used to close the shoulder in advance of them merging taper to direct vehicular traffic to remain within the traveled way.
8. Signs on left side of highway are warranted on left side of the highway if the highway is more than two lanes wide in the direction where the work is performed and the median the left shoulder is at least eight (8) feet wide.
9. If the left shoulder or center median width is less than eight (8) feet, at any of the specific location required, and there is no other reasonable location close by, then skip that sign and place the rest of the signs. Try to place at least the advanced warning sign such as **ROAD WORK 1 MILE** or **ROAD WORK 2 MILES**.
10. * Use this sign in addition to the 1-mile sign when the speed limit is 65 MPH.

MULTI-LANE ROAD-DIVIDED

WORK AREA IN RIGHT LANE

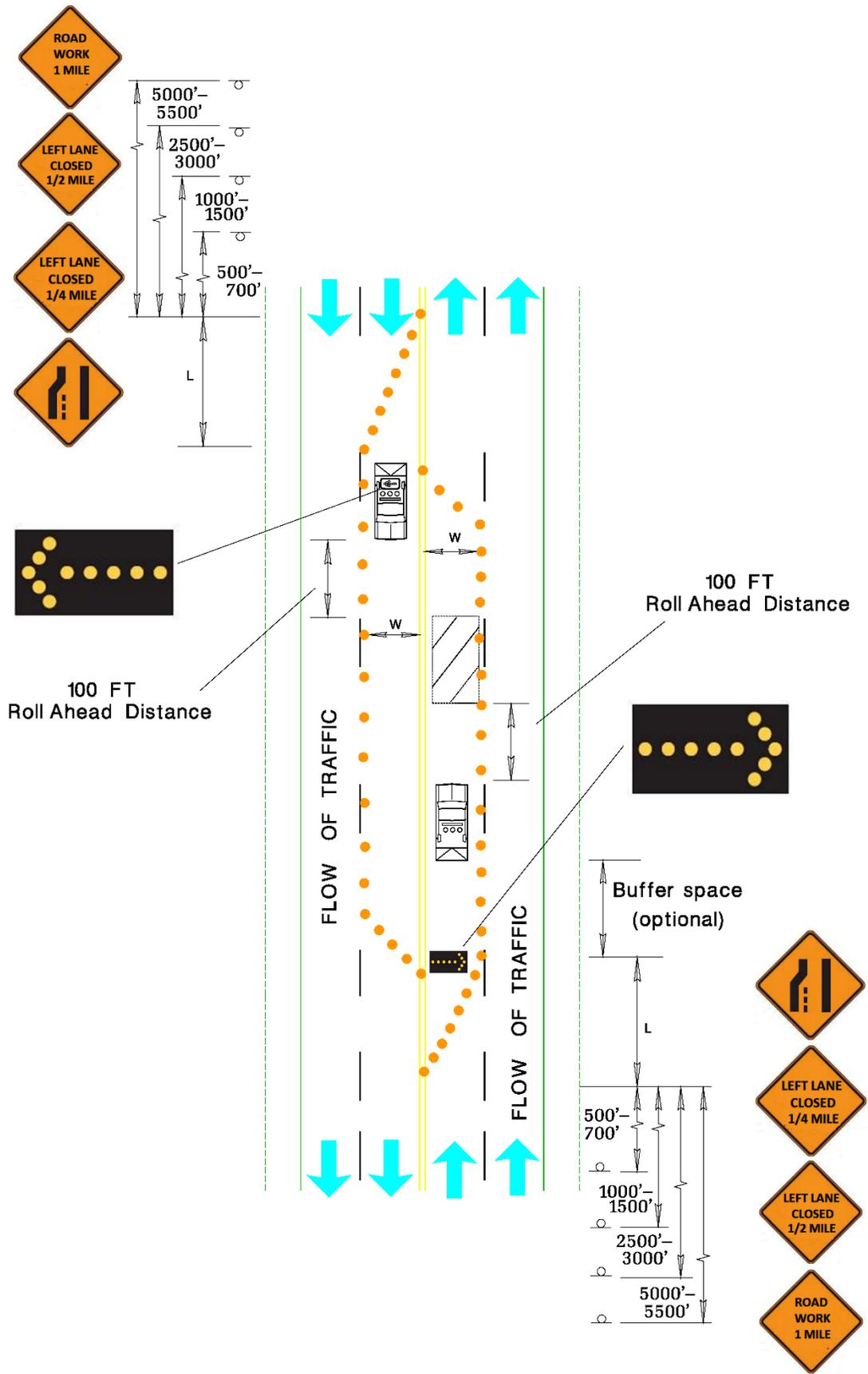


MULTI-LANE ROAD-DIVIDED

WORK AREA IN RIGHT LANE

1. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
2. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
3. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
4. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
5. The closure of the adjacent interior lane in the opposing direction may not be necessary, depending upon the activity being performed and the workspace needed for the operation.
6. Work operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacturer.
7. When paved shoulders having a width of eight (8) feet or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
8. Signs on left side of highway are warranted on left side of the highway if the highway is more than two lanes wide in the direction where the work is performed and the median or the left shoulder is at least eight (8) feet wide.
9. If the left shoulder or center median width is less than eight (8) feet, at any of the specific location required, and there is no other reasonable location close by, then skip that sign and place the rest of the signs. Try to place at least the advanced warning sign such as **ROAD WORK 1 MILE** or **ROAD WORK 2 MILES**.
10. *Use this sign in addition to the 1-mile sign when the speed limit is 65 MPH.

MULTI-LANE ROAD UNDIVIDED WORK AREA IN LEFT LANE

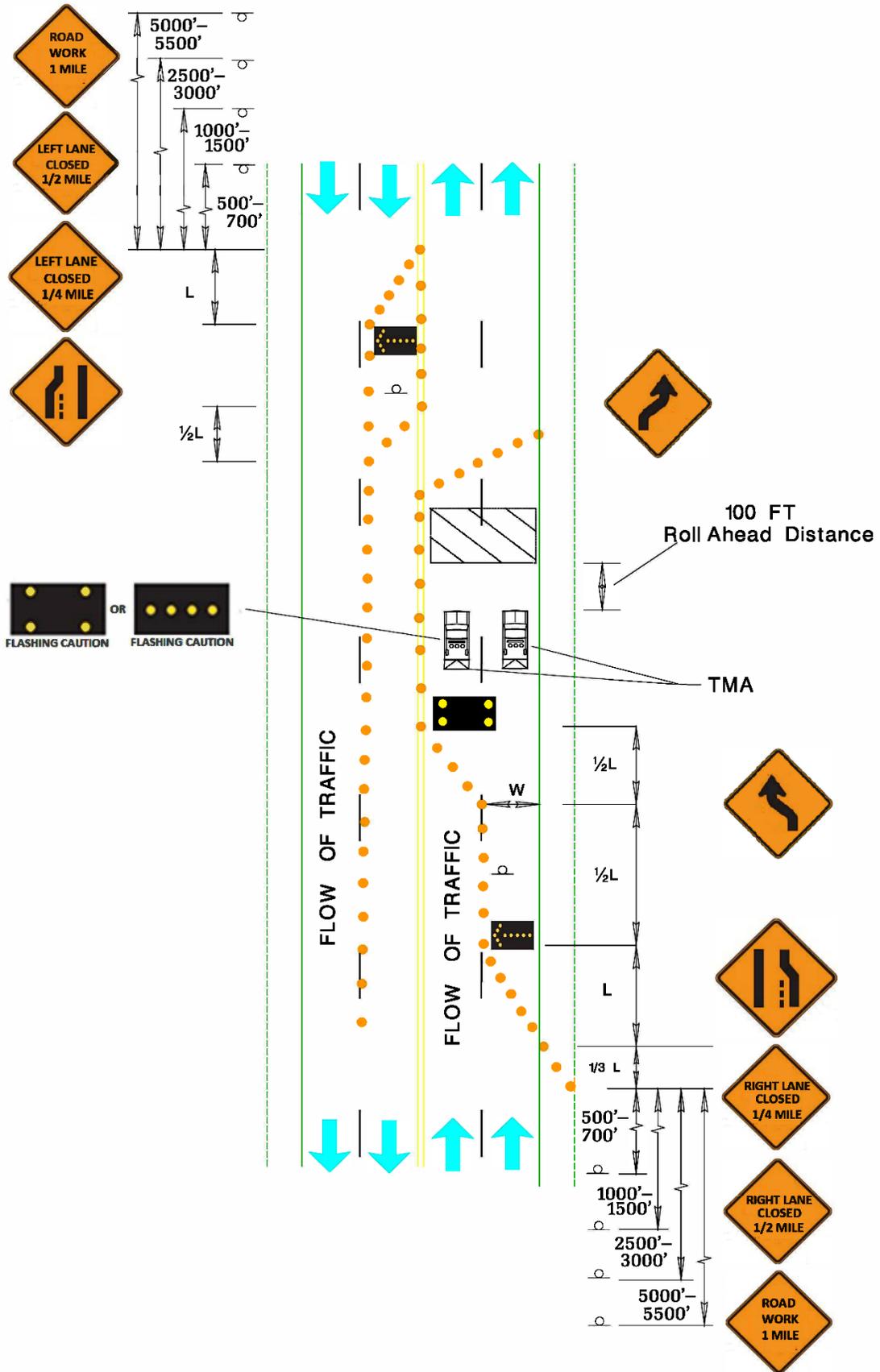


MULTI- LANE ROAD UNDIVIDED

WORK AREA IN LEFT LANE

1. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
2. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
3. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
4. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
5. The closure of the adjacent interior lane in the opposing direction may not be necessary, depending upon the activity being performed and the workspace needed for the operation.
6. Work operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacturer.

MULTI-LANE ROAD - UNDIVIDED WORK AREA CLOSED ONE DIRECTION



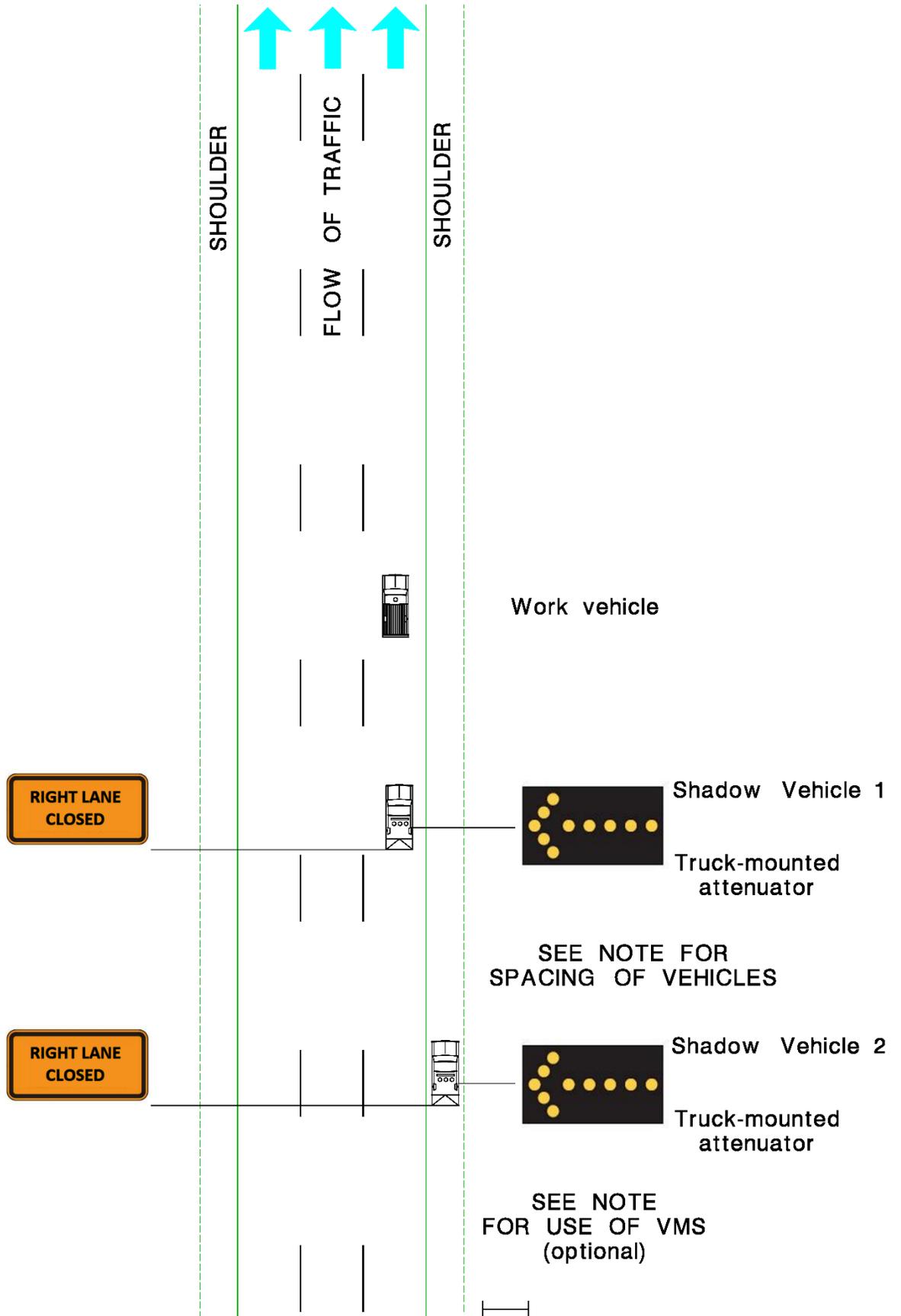
MULTI-LANE ROAD - UNDIVIDED

WORK AREA CLOSED ONE DIRECTION

1. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
2. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
3. For short-term and intermediate-term situations, where it is not feasible to remove and restore pavement markings, channelization shall be made dominant by using very close device spacing.
4. When paved shoulders having a width of eight (8) feet or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
5. A work operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH, the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacture.

MOBILE OPERATION ON MULTI-LANE ROAD

RIGHT LANE CLOSED



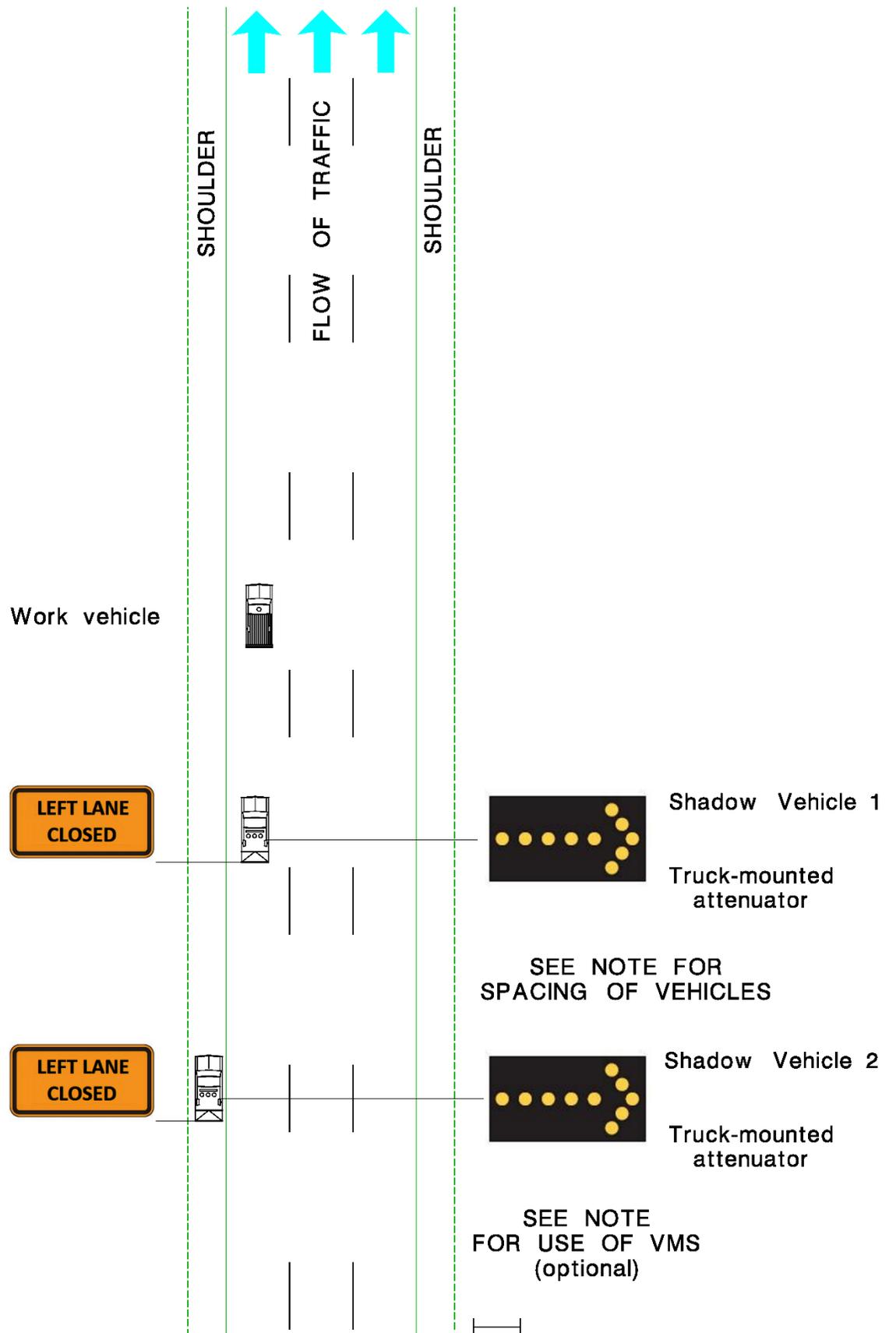
MOBILE OPERATION ON MULTI-LANE ROAD

RIGHT LANE CLOSED

1. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
2. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.
3. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
4. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
5. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
6. Vehicles used for these operations should be made highly visible with appropriate equipment, such as flags, signs, or arrow boards.
7. Shadow vehicle #1 equipped with an arrow board, an appropriate lane closure sign and a truck-mounted attenuator.
8. Shadow vehicle #2 equipped with an arrow board, an appropriate lane closure sign and a truck mounted attenuator.
9. Shadow vehicle #2 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.
10. The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.
11. Work should normally be accomplished during off-peak hours.
12. On high-speed roadways, a third shadow vehicle (not shown) may be used with Shadow vehicle #1 in the closed lane, Shadow vehicle #2 straddling the edge line, and Shadow vehicle #3 on the shoulder.
13. Where adequate shoulder width is not available, Shadow vehicle #2 may straddle the edge line.
14. A variable message sign (VMS) can be used to supplement an existing safety setup. It should be placed in a clear and visible location off the roadway, with as much sight distance as possible. Transportation Mobility should be consulted for appropriate messages, programming, and recommended distance placement.
15. Mobile operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacture.

MOBILE OPERATION ON MULTI-LANE ROAD

LEFT LANE CLOSED



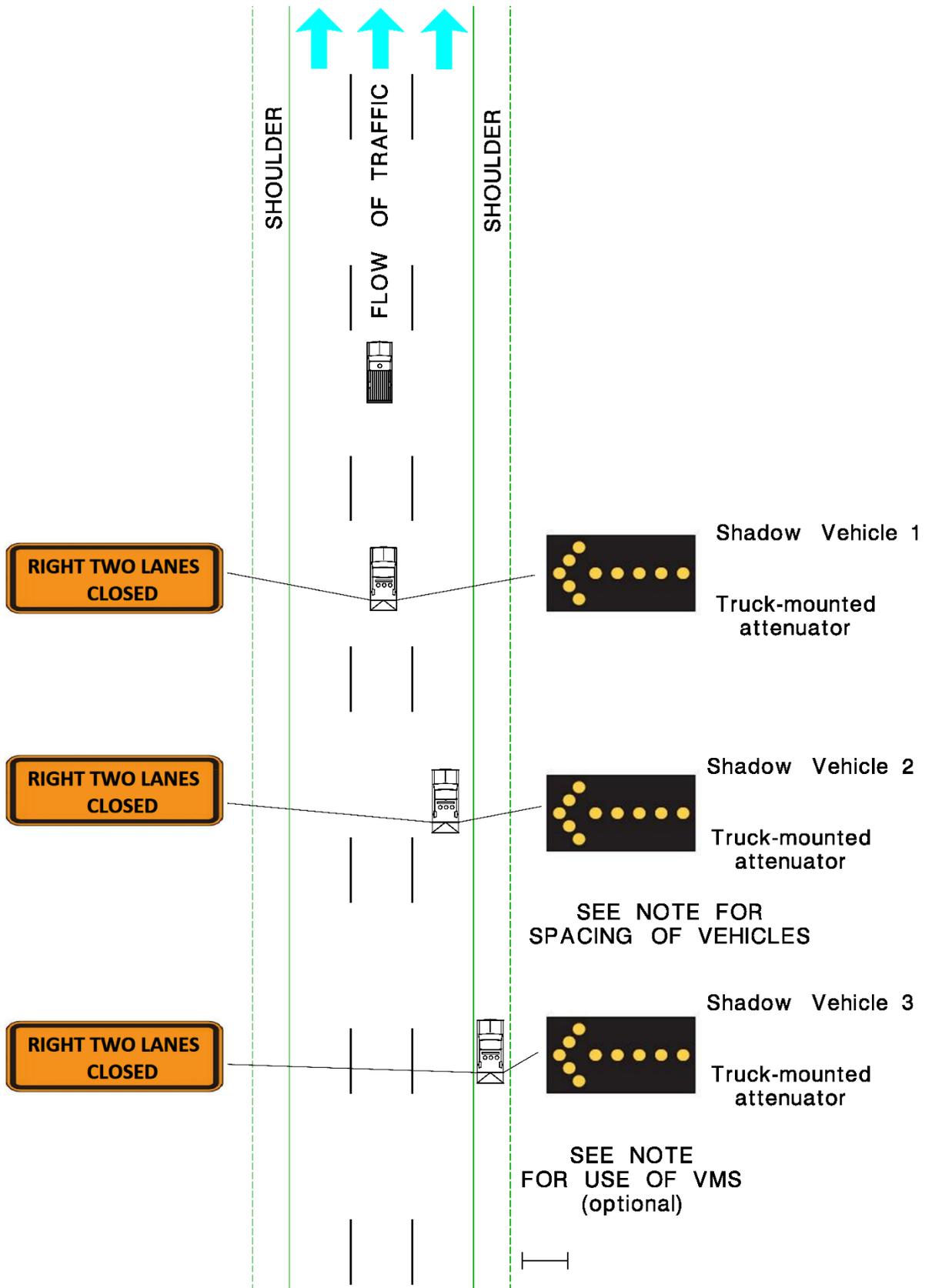
MOBILE OPERATION ON MULTI-LANE ROAD

LEFT LANE CLOSED

1. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
2. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.
3. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
4. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
5. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
6. Vehicles used for these operations should be made highly visible with appropriate equipment, such as flags, signs, or arrow boards.
7. Shadow vehicle #1 equipped with an arrow board, an appropriate lane closure sign and a truck-mounted attenuator.
8. Shadow vehicle #2 equipped with an arrow board, an appropriate lane closure sign and a truck mounted attenuator.
9. Shadow vehicle #2 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.
10. The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.
11. Work should normally be accomplished during off-peak hours.
12. On high-speed roadways, a third shadow vehicle (not shown) may be used with Shadow vehicle #1 in the closed lane, Shadow vehicle #2 straddling the edge line, and Shadow vehicle #3 on the shoulder.
13. Where adequate shoulder width is not available, Shadow vehicle #2 may straddle the edge line.
14. A variable message sign (VMS) can be used to supplement an existing safety setup. It should be placed in a clear and visible location off the roadway, with as much sight distance as possible. Transportation Mobility should be consulted for appropriate messages, programming, and recommended distance placement.
15. Mobile operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacture.

MOBILE OPERATION ON MULTI-LANE ROAD

RIGHT TWO LANES CLOSED



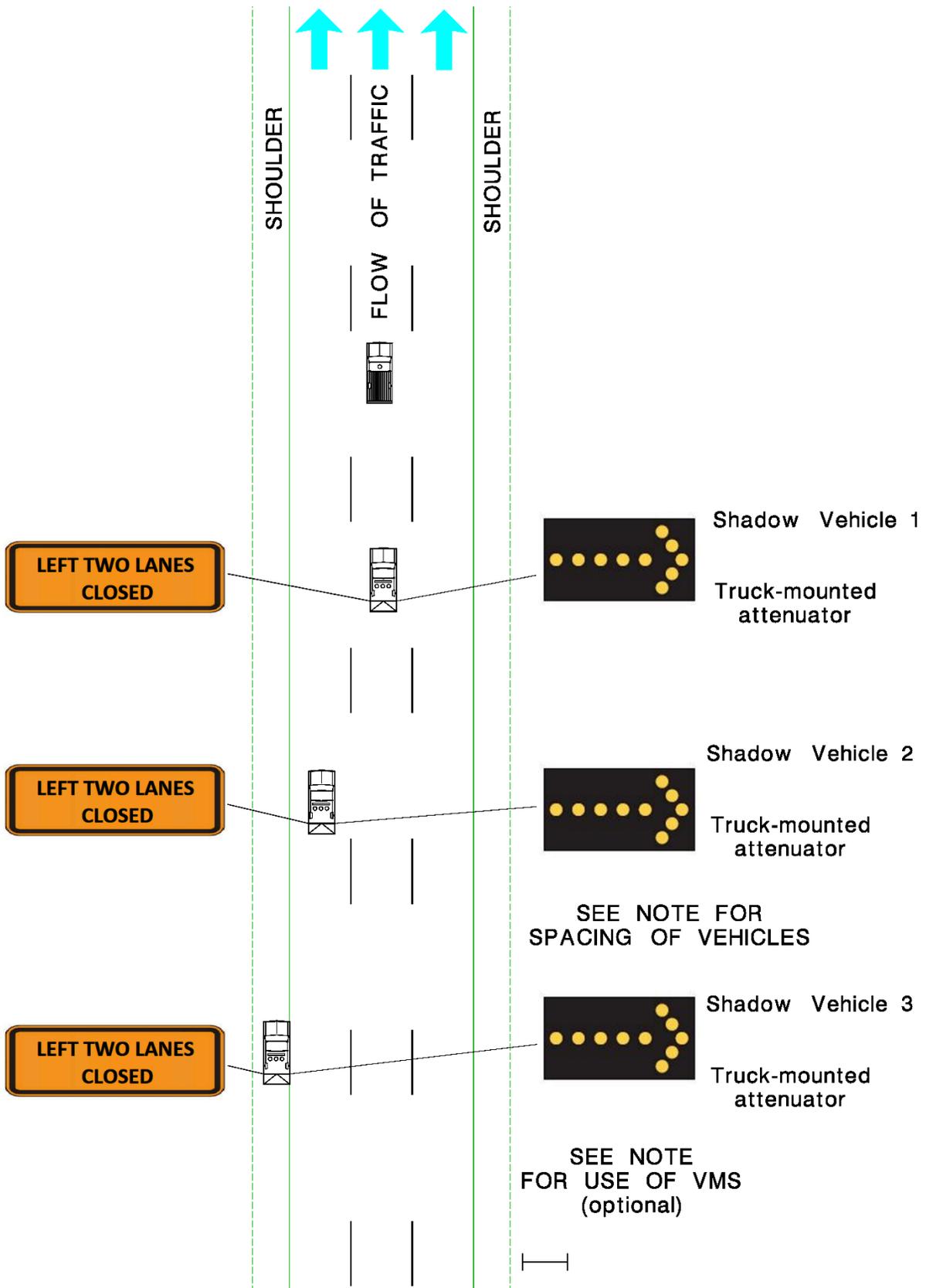
MOBILE OPERATION ON MULTI-LANE ROAD

RIGHT TWO LANES CLOSED

1. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
2. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.
3. Shadow and work vehicles shall display high-intensity rotating, flashing, oscillating, or strobe lights.
4. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
5. Vehicles used for these operations should be made highly visible with appropriate equipment, such as flags, signs, or arrow boards.
6. Shadow vehicle #1 equipped with an arrow board and appropriate lane closure sign and a truck-mounted attenuator.
7. Shadow vehicle #2 equipped with an arrow board an appropriate lane closure sign and a truck-mounted attenuator.
8. Shadow vehicle #3 equipped with an arrow board an appropriate lane closure sign and a truck-mounted attenuator.
9. Shadow vehicle #3 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.
10. The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.
11. Work should normally be accomplished during off-peak hours.
12. When the work vehicle occupies an interior lane (a lane other than the far right or far left), of a directional roadway having a right-hand shoulder 10 feet or more in width, Shadow vehicle #3 should drive the right-hand shoulder with a sign indicating that work is taking place in the interior lane.
13. Where adequate shoulder width is not available, Shadow vehicle #3 may straddle the edge line.
14. A variable message sign (VMS) can be used to supplement an existing safety setup. It is to be placed in a clear and visible location off the roadway, with as much sight distance as possible. Transportation Mobility should be consulted for appropriate messages, programming, and recommended distance placement.
15. A mobile operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacturer.

MOBILE OPERATION ON MULTI-LANE ROAD

LEFT TWO LANES CLOSED



MOBILE OPERATION ON MULTI-LANE ROAD

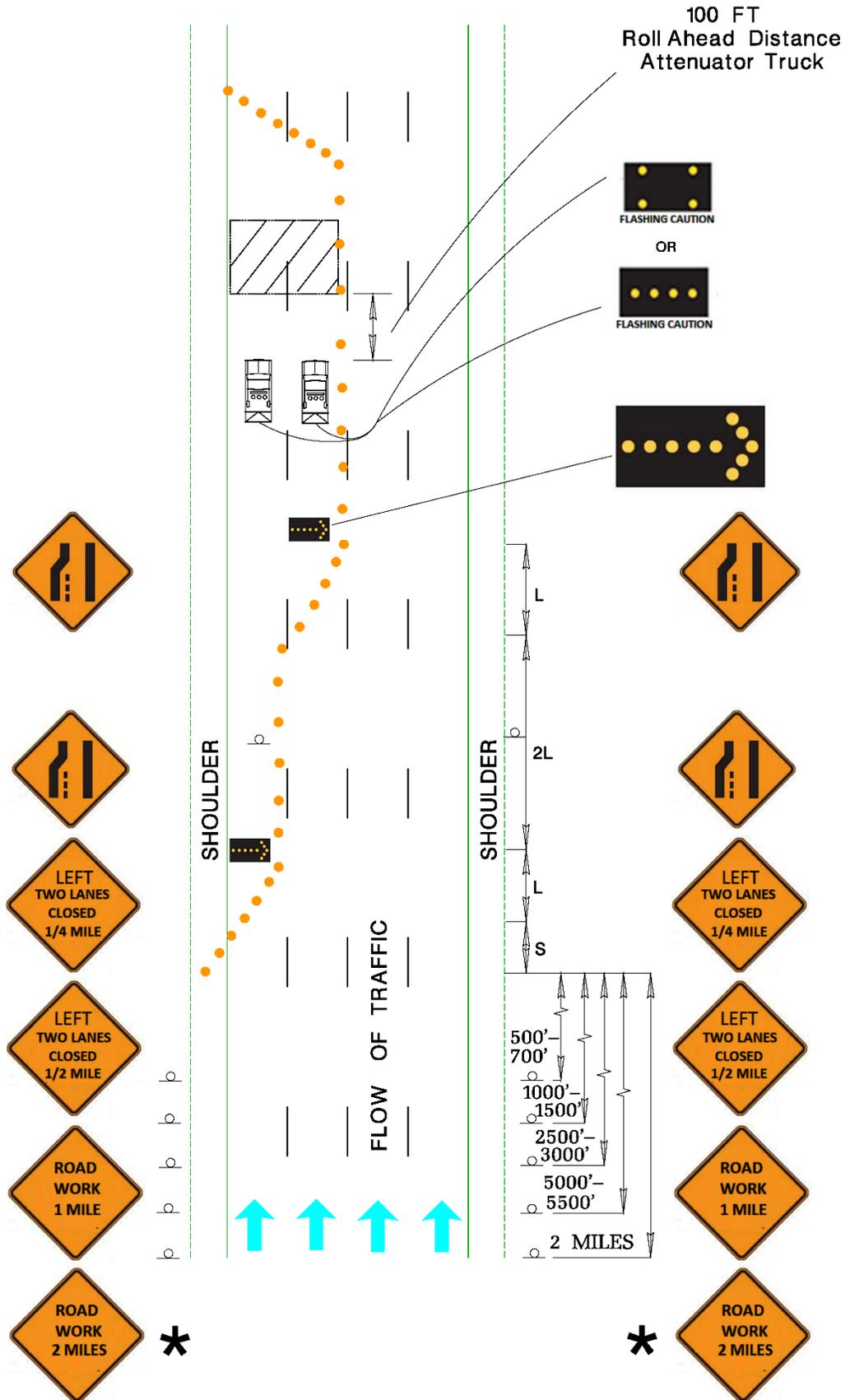
LEFT TWO LANES CLOSED

1. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
2. Vehicle-mounted signs shall be mounted in a manner such that they are not obscured by equipment or supplies. Sign legends on vehicle-mounted signs shall be covered or turned from view when work is not in progress.
3. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
4. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
5. Vehicles used for these operations should be made highly visible with appropriate equipment, such as flags, signs, or arrow boards.
6. Shadow vehicle #1 equipped with an arrow board and appropriate lane closure sign and a truck-mounted attenuator.
7. Shadow vehicle #2 equipped with an arrow board an appropriate lane closure sign and a truck-mounted attenuator.
8. Shadow vehicle #3 equipped with an arrow board an appropriate lane closure sign and a truck-mounted attenuator.
9. Shadow vehicle #3 should travel at a varying distance from the work operation so as to provide adequate sight distance for vehicular traffic approaching from the rear.
10. The spacing between the work vehicles and the shadow vehicles, and between each shadow vehicle should be minimized to deter road users from driving in between.
11. Work should normally be accomplished during off-peak hours.
12. When the work vehicle occupies an interior lane (a lane other than the far right or far left), of a directional roadway having a right-hand shoulder 10 feet or more in width, Shadow vehicle #3 should drive the right-hand shoulder with a sign indicating that work is taking place in the interior lane.
13. Where adequate shoulder width is not available, Shadow vehicle #3 may straddle the edge line.
14. A variable message sign (VMS) can be used to supplement an existing safety setup. It is to be placed in a clear and visible location off the roadway, with as much sight distance as possible. Transportation Mobility should be consulted for appropriate messages, programming, and recommended distance placement.
15. A mobile operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacturer.

RIGHT TWO LANES CLOSED **MULTI-LANE DIVIDED ROAD**

1. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
2. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
3. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
4. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
5. A work operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacturer.
6. Signs on the left side of the highway are warranted if the highway is:
 - a. More than two lanes wide in the direction where the work is being performed.
 - b. The median or the left shoulder is at least eight (8) feet wide.
 - c. If the left shoulder or center median width is less than eight (8) feet, at any of the specific location required, and there is no other reasonable location close by, then skip that sign and place the rest of the signs. Try to place at least the advanced warning sign such as **ROAD WORK 1 MILE** or **ROAD WORK AHEAD**.
7. *Use the **ROAD WORK 2 MILES** sign in addition to the **ROAD WORK 1 MILE** sign when the speed limit is 65 MPH.

LEFT TWO LANES CLOSED MULTI-LANE DIVIDED ROAD

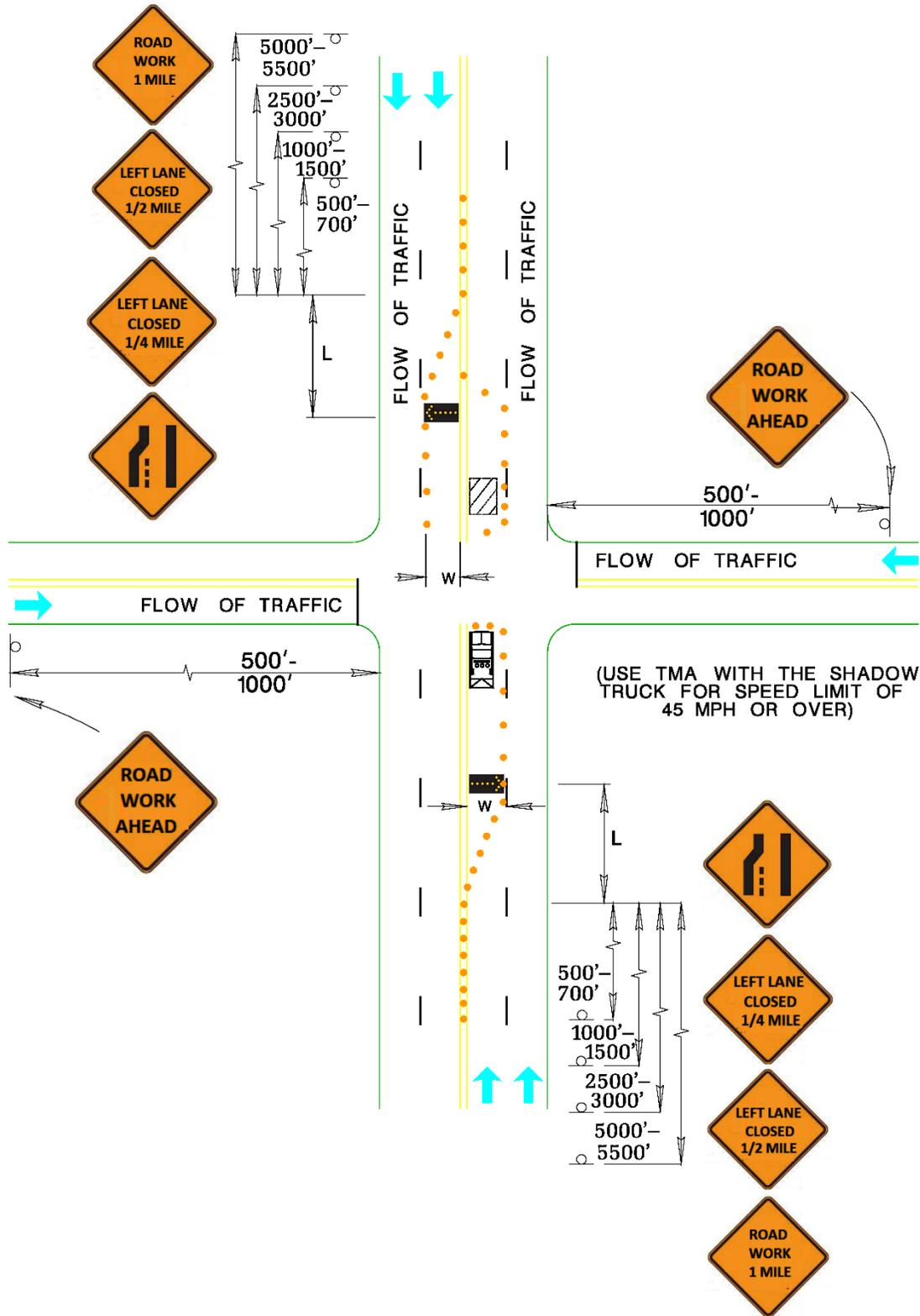


LEFT TWO LANES CLOSED

MULTI-LANE DIVIDED ROAD

1. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
2. Arrow boards shall, as a minimum, be Type B, with a size of 60 x 30 inches.
3. Shadow and work vehicles shall display high intensity rotating, flashing, oscillating, or strobe lights.
4. Vehicle hazard warning signals may be used to supplement high intensity rotating, flashing, oscillating, or strobe lights.
5. A work operation conducted in the active or part of the active lanes of a roadway, where the speed limit exceeds 35 MPH the shadow vehicle equipped with an attenuator, arrow board and maintaining a suggested distance of 75 to 150 feet or as recommended by the Attenuator Manufacturer.
6. Signs on the left side of the highway are warranted if the highway is:
 - a. More than two lanes wide in the direction where the work is being performed.
 - b. The median or the left shoulder is at least eight (8) feet wide.
 - c. If the left shoulder or center median width is less than eight (8) feet, at any of the specific location required, and there is no other reasonable location close by, then skip that sign and place the rest of the signs. Try to place at least the advanced warning sign such as **ROAD WORK 1 MILE** or **ROAD WORK AHEAD**.
7. *Use the **ROAD WORK 2 MILES** sign in addition to the **ROAD WORK 1 MILE** sign when the speed limit is 65 MPH.

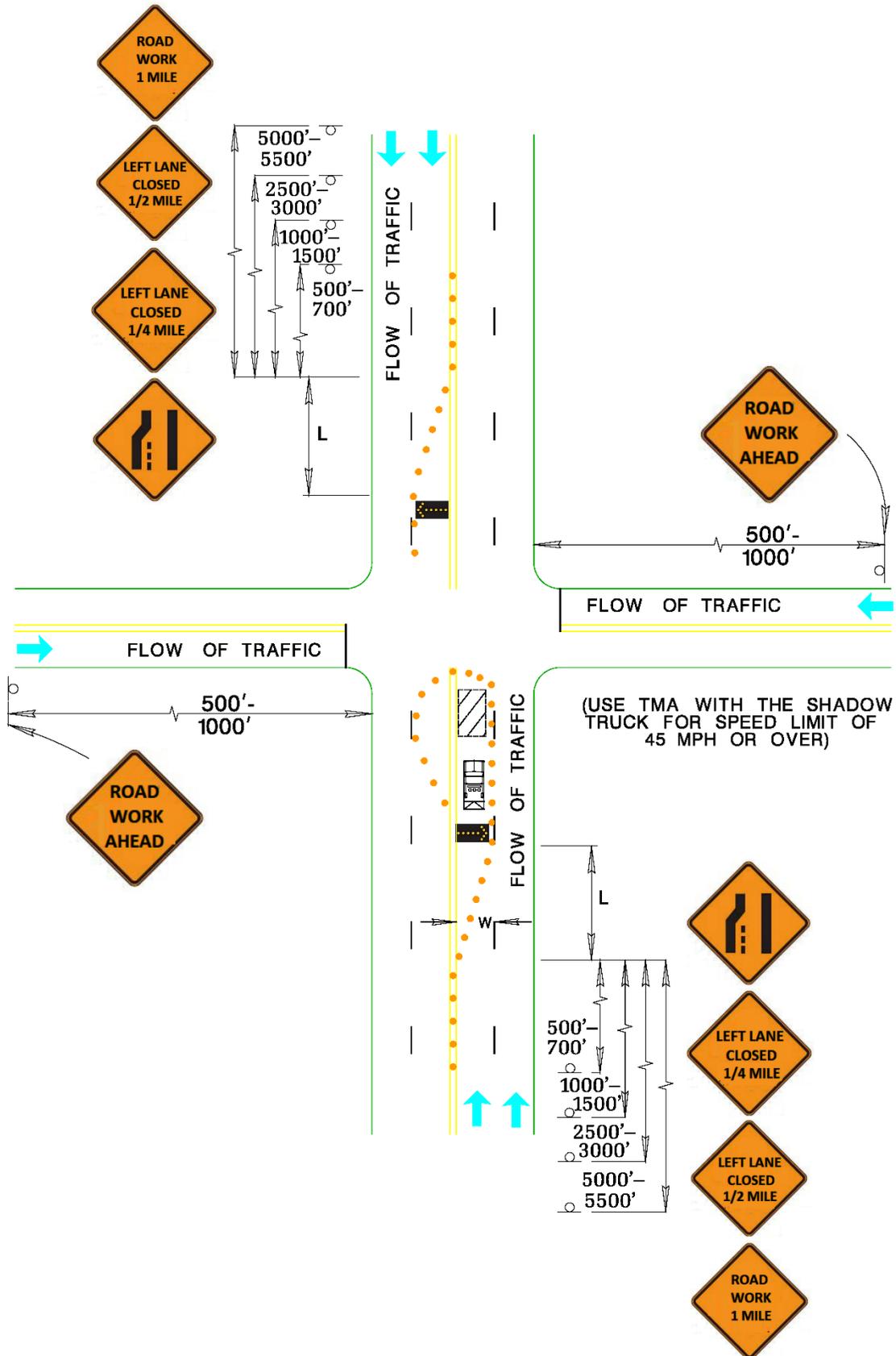
MULTI-LANE ROAD-UNDIVIDED WORK AREA IN LEFT LANE AT INTERSECTION FAR SIDE



MULTI-LANE ROAD-UNDIVIDED WORK AREA IN LEFT LANE AT INTERSECTION FAR SIDE

1. If the workspace extends across a crosswalk, the crosswalk should be closed using the information and devices shown in the MUTCD Chapter 6. When crosswalks and/or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.
2. When turn prohibitions are implemented, two turn prohibition signs should be used, one on the near side and space permitting, one on the far side of the intersection.
3. Use shadow vehicle with TMA protection for speed limits of 45 MPH and greater.
4. A buffer space may be used between opposing directions of vehicular traffic as shown in this application.
5. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right-hand lane having significant right turning movements, then the right-hand lane may be restricted to right turns only, as shown. This procedure increases the through capacity by eliminating right turns from the open through lane.
6. Where the turning radius is large, a right-turn island using channelizing devices may be used.
7. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.

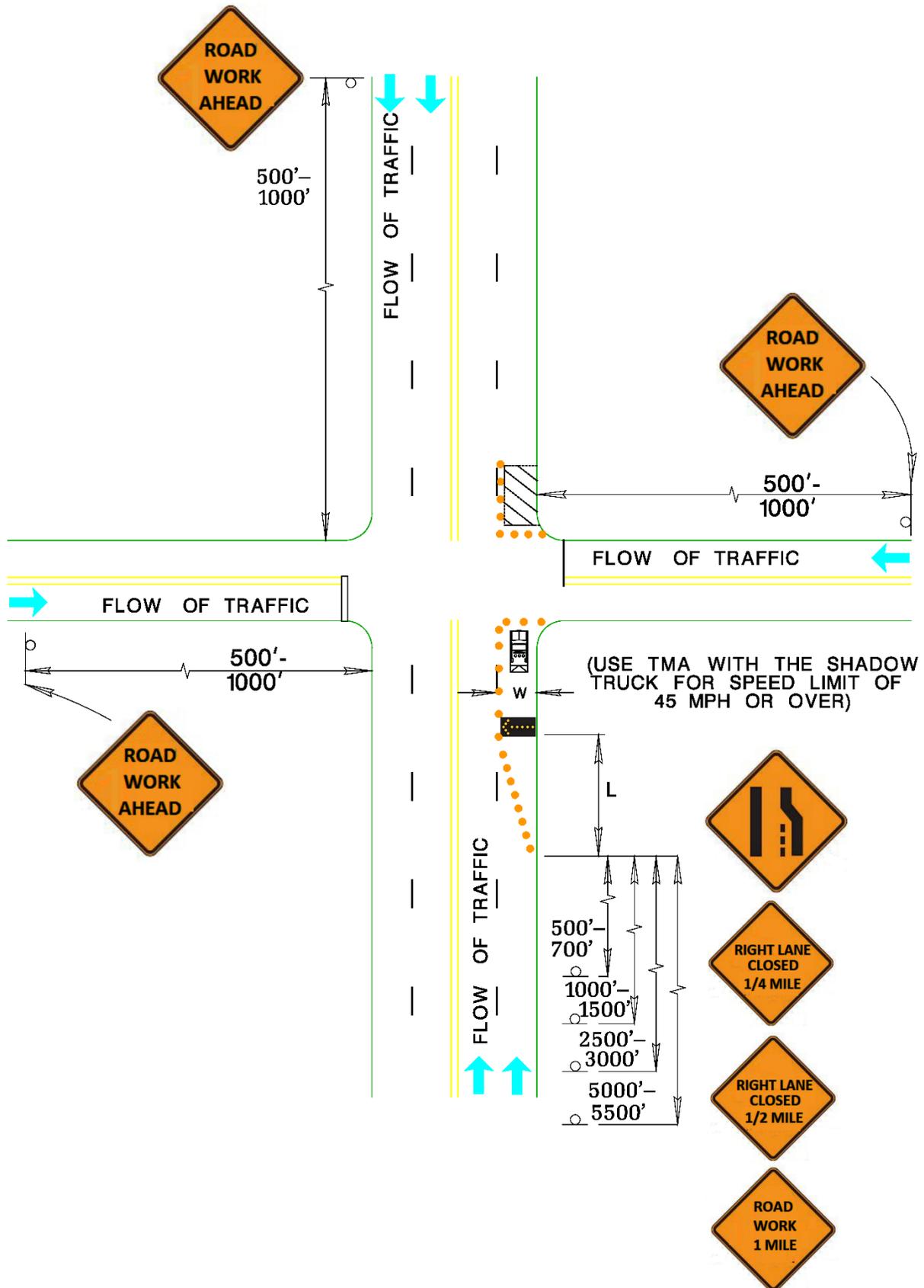
MULTI-LANE ROAD-UNDIVIDED WORK AREA IN LEFT LANE AT INTERSECTION NEAR SIDE



MULTI-LANE ROAD-UNDIVIDED WORK AREA IN LEFT LANE AT INTERSECTION NEAR SIDE

1. If the workspace extends across a crosswalk, the crosswalk should be closed using the information and devices shown in the MUTCD part 6H. When crosswalks or other pedestrian facilities are closed and/or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.
2. Use shadow vehicle with TMA protection for speed limits of 45 MPH and greater.
3. For intersection approaches reduced to a single lane, left-turning movements may be prohibited to maintain capacity for through vehicular traffic.
4. Where the turning radius is significant, it may be possible to create a right-turn island using channelizing devices or pavement markings.

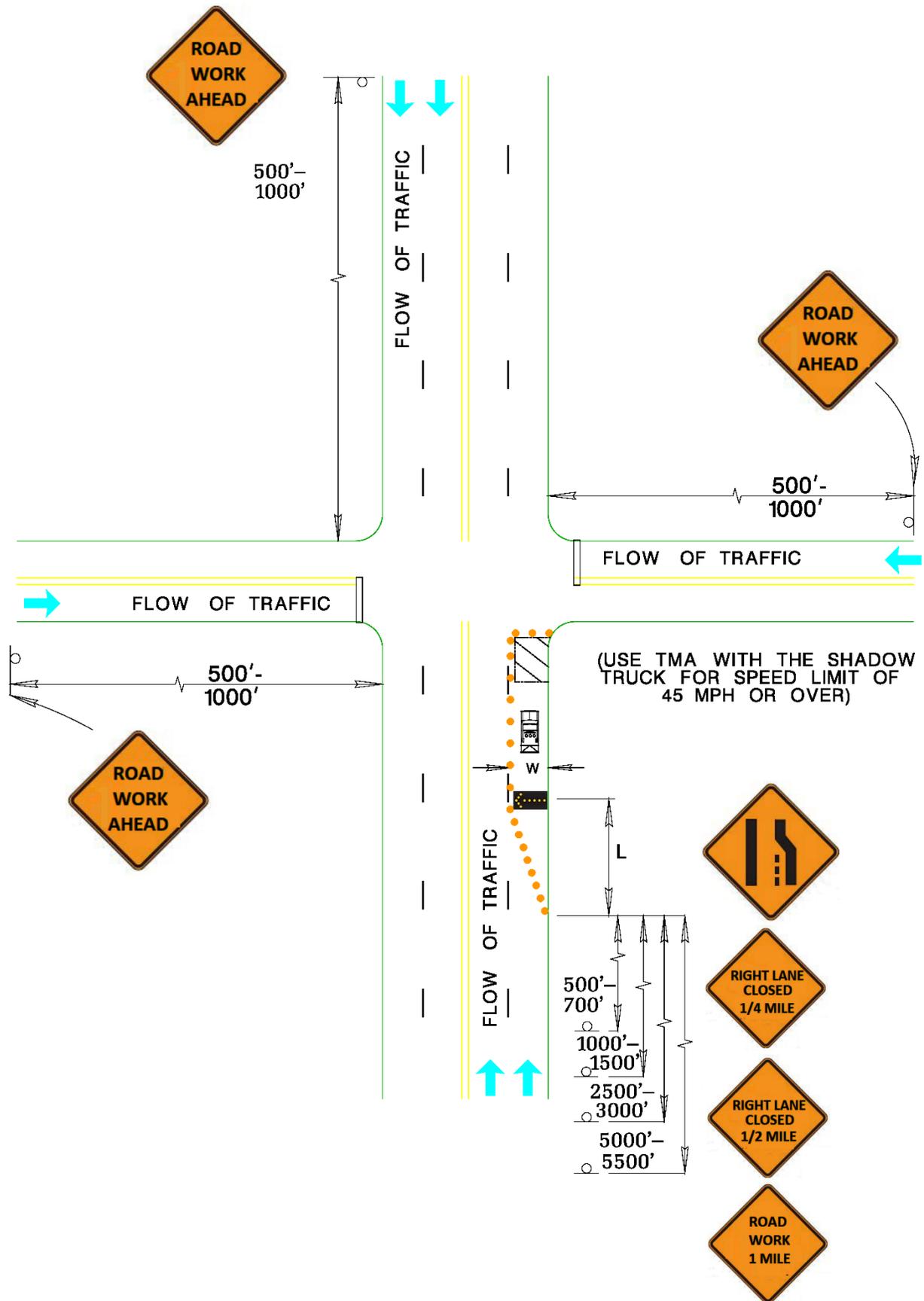
MULTI-LANE ROAD-UNDIVIDED WORK AREA IN RIGHT LANE AT INTERSECTION FAR SIDE



MULTI-LANE ROAD-UNDIVIDED WORK AREA IN RIGHT LANE AT INTERSECTION FAR SIDE

1. If the workspace extends across a cross walk, the cross walk should be closed using the information and devices shown in the MUTCD part 6H. When crosswalks and/or other pedestrian facilities are closed or relocated, temporary facilities shall be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility.
2. When turn prohibitions are implemented, two turn prohibition signs should be used, one on the near side and space permitting, one on the far side of the intersection.
3. Use shadow vehicle with TMA protection for speed limits of 45 MPH and greater.
4. A buffer space may be used between opposing directions of vehicular traffic as shown in this application.
5. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right-hand lane having significant right turning movements, then the right-hand lane may be restricted to right turns only, as shown.
6. Where the turning radius is significant, a right-turn island using channelizing devices may be used.
7. For intersection approaches that are reduced to a single lane, left-turn movements may be prohibited to maintain capacity for through vehicular traffic.
8. Keeping the right-hand lane open increases the through capacity by eliminating right turns from the open through lane.

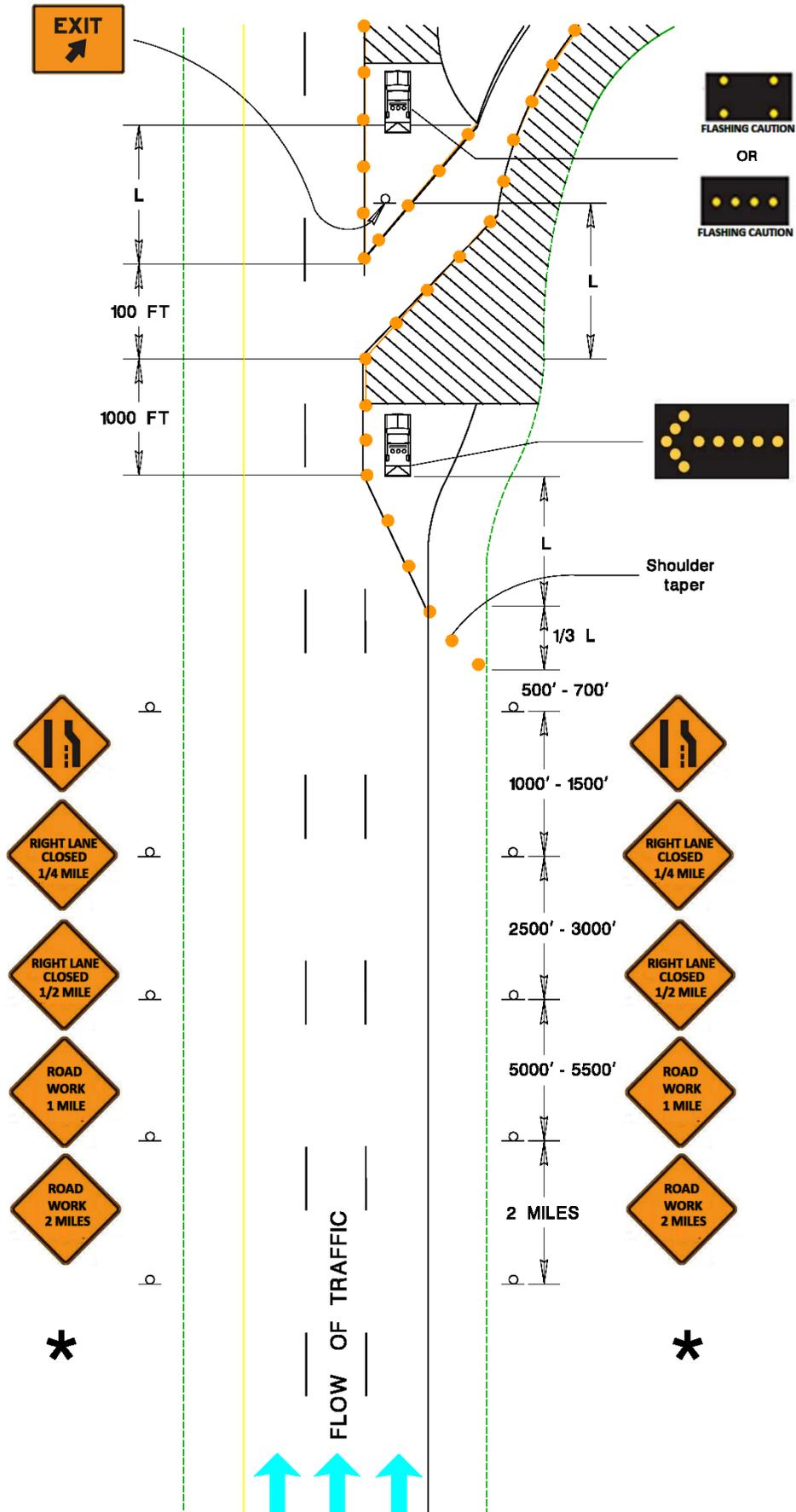
MULTI-LANE ROAD UNDIVIDED WORK AREA IN RIGHT LANE AT THE INTERSECTION NEAR SIDE



MULTI-LANE ROAD UNDIVIDED WORK AREA IN RIGHT LANE AT THE INTERSECTION NEAR SIDE

1. If the workspace extends across a crosswalk, the crosswalk should be closed using the information and devices shown in the MUTCD part 6H.
2. Use shadow vehicle with TMA protection for speed limits of 45 MPH and greater.
3. The normal procedure is to close on the near side of the intersection any lane that is not carried through the intersection. However, when this results in the closure of a right-hand lane having significant right turning movements, then the right-hand lane may be restricted to right turns only, as shown. This procedure increases the through capacity by eliminating right turns from the open through lane.
4. For intersection approaches reduced to a single lane, left-turn movements may be prohibited to maintain capacity for through vehicular traffic.
5. Where the turning radius is significant, it may be possible to create a right-turn island using channelizing devices or pavement markings.

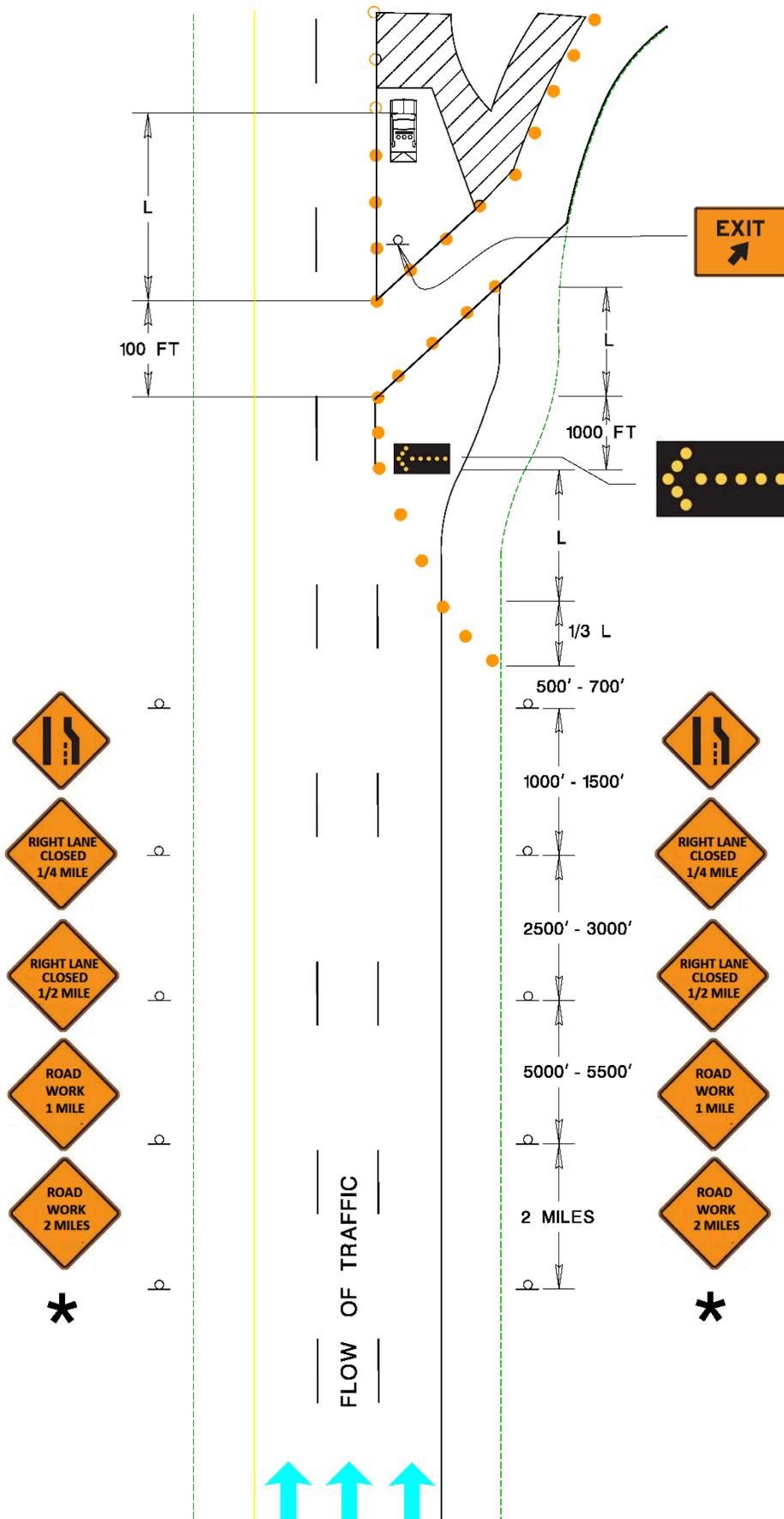
WORK IN THE VICINITY OF AN EXIT RAMP



WORK IN THE VICINITY OF AN EXIT RAMP

1. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
2. A temporary **EXIT** sign shall be located in the temporary gore. The bottom of the **EXIT** sign mounted on a portable support, shall be at least 1 foot above the travel way.
3. The guide signs should indicate that the ramp is open, and where the temporary ramp is located. However, if the ramp is closed, guide signs should indicate that the ramp is closed.
4. When the exit ramp is closed, a black on orange **EXIT CLOSED** sign panel should be placed diagonally across the interchange/intersection guide signs.
5. The temporary **EXIT** sign placed in the temporary gore maybe either black on orange or white on green.
6. An alternative procedure that may be used is to channelize exiting vehicular traffic onto the right-hand shoulder and close the lane as necessary.
7. When paved shoulders having a width of eight (8) feet or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
8. Signs on the left side of the highway are warranted if the highway is:
 - a. More than two lanes wide in the direction where the work is being performed.
 - b. The median or the left shoulder is at least eight (8) feet wide.
 - c. If the left shoulder or center median width is less than eight (8) feet, at any of the specific location required, and there is no other reasonable location close by, then skip that sign and place the rest of the signs. Try to place at least the advanced warning sign such as **ROAD WORK 1 MILE** or **ROAD WORK AHEAD**.
9. * Use **ROAD WORK 2 MILES** in addition to the **ROAD WORK 1 MILE** sign when the speed limit is 65 MPH.

WORK IN THE VICINITY OF AN EXIT RAMP

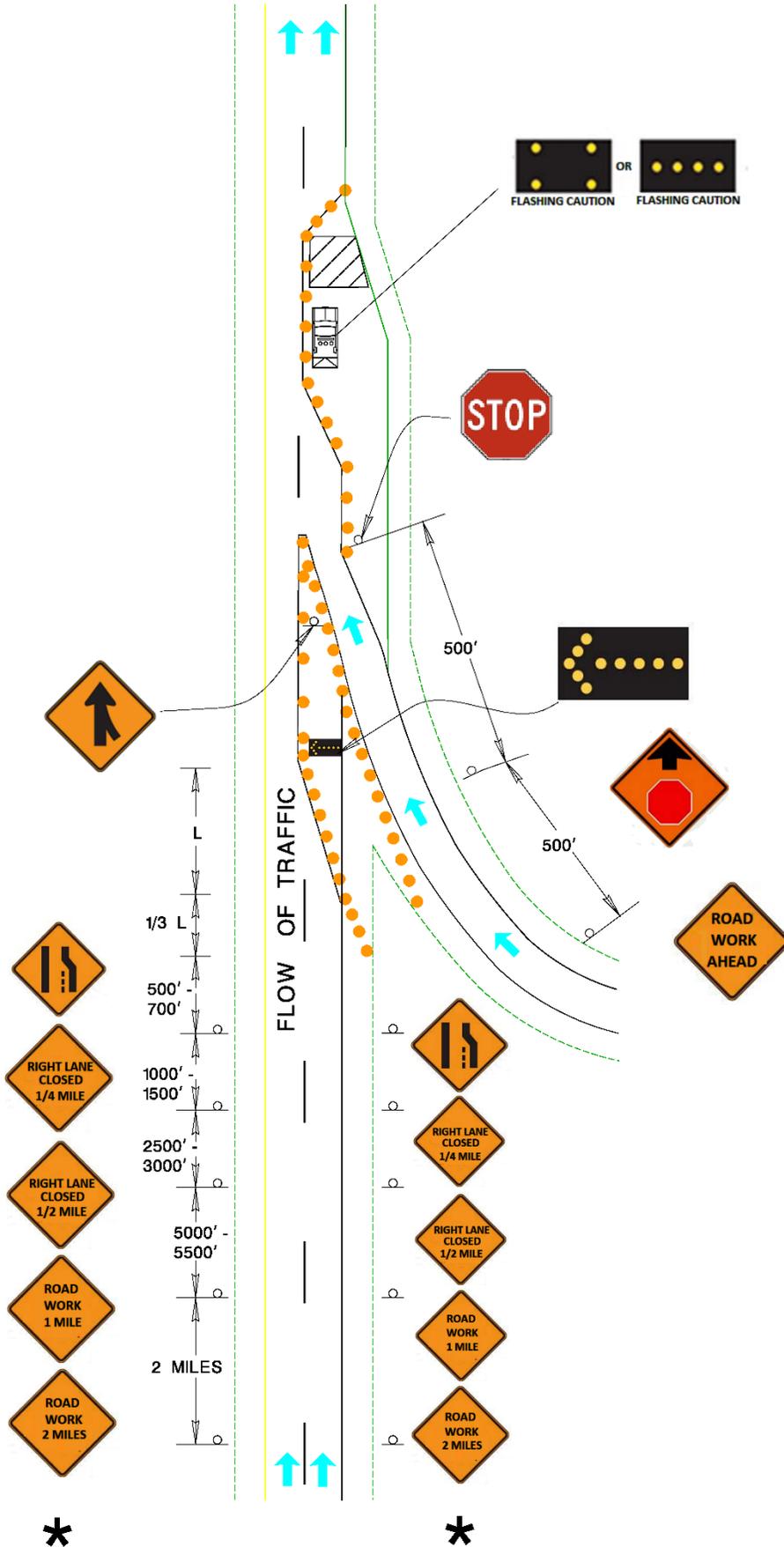


WORK IN THE VICINITY OF AN EXIT RAMP

1. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
2. A temporary **EXIT** sign shall be located in the temporary gore. The bottom of the **EXIT** sign mounted on a portable support, shall be at least 1 foot above the travel way.
3. The guide signs should indicate that the ramp is open, and where the temporary ramp is located. However, if the ramp is closed, guide signs should indicate that the ramp is closed.
4. When the exit ramp is closed, a black on orange **EXIT CLOSED** sign panel should be placed diagonally across the interchange/intersection guide signs.
5. The temporary **EXIT** sign placed in the temporary gore maybe either black on orange or white on green.
6. An alternative procedure that may be used is to channelize exiting vehicular traffic onto the right-hand shoulder and close the lane as necessary.
7. When paved shoulders having a width of eight (8) feet or more are closed, channelizing devices should be used to close the shoulder in advance of the merging taper to direct vehicular traffic to remain within the traveled way.
8. Signs on the left side of the highway are warranted if the highway is:
 - a. More than two lanes wide in the direction where the work is being performed.
 - b. The median or the left shoulder is at least eight (8) feet wide.
 - c. If the left shoulder or center median width is less than eight (8) feet, at any of the specific location required, and there is no other reasonable location close by, then skip that sign and place the rest of the signs. Try to place at least the advanced warning sign such as **ROAD WORK 1 MILE** or **ROAD WORK AHEAD**.
9. * Use **ROAD WORK 2 MILES** in addition to the **ROAD WORK 1 MILE** sign when the speed limit is 65 MPH.

WORK IN THE VICINITY OF AN ENTRANCE

RAMP MERGE REQUIRED



WORK IN THE VICINITY OF AN ENTRANCE

RAMP MERGE REQUIRED

1. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
2. An acceleration lane of sufficient length should be provided whenever possible.
3. When used, the **YIELD** or **STOP** sign should be located so that ramp vehicular traffic has adequate sight distance of oncoming mainline vehicular traffic to select an acceptable gap in the mainline vehicular traffic flow but should not be located so far forward that motorists will be encouraged to stop in the path of the mainline traffic. Also, a longer acceleration lane should be provided beyond the sign to reduce the gap size needed. If insufficient gaps are available, consideration should be given to closing the ramp.
4. The main line merging taper with the arrow board at its starting point should be located sufficiently in advance so that the arrow board is not confusing to drivers on the entrance ramp, and so that the mainline merging vehicular traffic from the lane closure has the opportunity to stabilize before encountering the vehicular traffic merging from the ramp.
5. If the ramp curves sharply to the right, warning signs with advisory speeds located in advance of the entrance terminal should be placed in pairs (one on each side of the ramp).
6. Signs on the left side of the highway are warranted if the highway is:
 - a. More than two lanes wide in the direction where the work is being performed.
 - b. The median or the left shoulder is at least eight (8) feet wide.
 - c. If the left shoulder or center median width is less than eight (8) feet, at any of the specific location required, and there is no other reasonable location close by, then skip that sign and place the rest of the signs. Try to place at least the advanced warning sign such as **ROAD WORK 1 MILE** or **ROAD WORK AHEAD**.
7. * Use **ROAD WORK 2 MILES** in addition to the **ROAD WORK 1 MILE** sign when the speed limit is 65 MPH.

WORK IN THE VICINITY OF AN ENTRANCE

RAMP ADDED LANE

1. An arrow board shall be used when a freeway lane is closed. When more than one freeway lane is closed, a separate arrow board shall be used for each closed lane.
2. An acceleration lane of sufficient length should be provided whenever possible as shown on the diagram.
3. The main line merging taper with the arrow board at its starting point should be located sufficiently in advance so that the arrow board is not confusing to drivers on the entrance ramp, and so that the mainline merging vehicular traffic from the lane closure has the opportunity to stabilize before encountering the vehicular traffic merging from the ramp.
4. Signs on the left side of the highway are warranted if the highway is:
 - a. More than two lanes wide in the direction where the work is being performed.
 - b. The median or the left shoulder is at least eight (8) feet wide.
 - c. If the left shoulder or center median width is less than eight (8) feet, at any of the specific location required, and there is no other reasonable location close by, then skip that sign and place the rest of the signs. Try to place at least the advanced warning sign such as **ROAD WORK 1 MILE** or **ROAD WORK AHEAD**.
5. * Use **ROAD WORK 2 MILES** in addition to the **ROAD WORK 1 MILE** sign when the speed limit is 65 MPH.

TRAFFIC INCIDENT MANAGEMENT (TIM)

I. PURPOSE

To establish Temporary Traffic Control procedures for traffic incident management and emergent conditions, while maintaining employee safety measures. This section of the NJDOT Work Zone Safety Set-Up Guide also addresses the initial response to a traffic incident.

Emergency-vehicle lighting (such as high-intensity, rotating, flashing, oscillating, or strobe lights) installed on vehicles, and traffic control devices available on-site, should be used. The temporary traffic control zone extends from the first warning device (such as a sign, light, or cone) to the last temporary traffic control (TTC) device or to a point where vehicles return to the original lane alignment and are clear of the incident.

On-scene personnel should take measures to move the incident off the traveled roadway or to provide for appropriate warning. On-scene personnel should constantly be aware of their visibility to oncoming traffic and wear high-visibility apparel.

II. SCOPE

This procedure outlines the criteria necessary to perform traffic control through a traffic incident management area and to provide protection for responding employees. On-scene personnel shall follow all other safety procedures for working on or near the roadway.

III. DEFINITIONS

TRAFFIC INCIDENT:

An emergency road user occurrence, a natural disaster, or other unplanned event that affects or impedes the normal flow of traffic.

TRAFFIC INCIDENT MANAGEMENT AREA:

An area of a highway where temporary traffic controls are installed, as authorized by a public authority or the official having jurisdiction of the roadway, in response to an incident, natural disaster, hazardous material spill, or other unplanned incident.

MINOR TRAFFIC INCIDENT:

A class of a traffic incident that has an expected duration of less than 30 minutes. (See explanation of traffic incident classes on page 70)

INTERMEDIATE TRAFFIC INCIDENT:

A class of a traffic incident that has an expected duration of more than 30 minutes up to approximately 2 hours.

MAJOR TRAFFIC INCIDENT:

A class of a traffic incident that has an expected duration of more than 2 hours.

TRAFFIC INCIDENT MANAGEMENT (TIM)

EMERGENT CONDITION:

An unplanned, unexpected, emergency operation that requires a prompt and urgent response to address an immediate hazard to the motoring public. An immediate hazard may be defined as an event that results in an unexpected situation urgently requiring prompt action.

Examples include but are not limited to large debris in the travel lanes: large debris in the shoulder that may find its way into the travel lanes; disabled vehicles in the travel lanes or shoulder; snow and ice control. On-scene personnel shall activate high-intensity rotating, flashing oscillating or strobe lights on their vehicles when working to clear emergent conditions from the roadway.

IV. GUIDANCE

A. Overview

In order to ensure the safety of employees and the motoring public, temporary traffic control measures shall be implemented according to this Work Zone Safety Set-Up Guide.

B. Assessment of the Traffic Incident

1. During the first 15 minutes of an incident, the on-scene personnel shall estimate the magnitude of the traffic incident, the expected time duration of the traffic incident. Reassessments should be conducted at intervals of approximately 30 minutes and 90 minutes after arriving at the scene, to determine if the category needs to be changed. On-scene employees shall initiate traffic control appropriate for the original assessment and if applicable, for any reassessments.
2. The on-scene personnel shall establish traffic control and request assistance consistent with the estimated category of the traffic incident.
3. Employees shall always be aware of:
 - Their visibility to oncoming traffic
 - Roadway geometrics
 - The need for warning devices
 - Approaching traffic speed and volume - The decision as to which additional protection is required, shall be considered depending on the actual traffic speed at the incident scene.

TRAFFIC INCIDENT MANAGEMENT (TIM)

C. Use of Emergency-Vehicle Lighting:

1. The use of emergency-vehicle lighting (such as high-intensity, rotating, flashing, oscillating, or strobe lights) is essential, especially in the initial stages of a traffic incident, for the safety of emergency responders and persons involved in the traffic incident, as well as road users approaching the traffic incident.
2. The use of emergency-vehicle lighting can be reduced if appropriate traffic control has been established at a traffic incident scene. This is especially true for major traffic incidents that might involve a number of emergency vehicles. If appropriate traffic control procedures are established through the placement of advance warning signs and traffic control devices to divert or detour traffic, then public safety agencies can perform their tasks on scene with minimal emergency-vehicle lighting.

D. Advance Warning and Guide Signs

1. Advance warning and guide signs used for traffic incident management situations may have a black legend and border on a fluorescent pink background. Examples of Traffic Incident Management Area signs can be found in the MUTCD Figure 6I-1.

E. Traffic Control by Class - Minor, Intermediate, and Major

Every effort shall be made to remove the incident from the travel lane(s). Appropriate warning devices and procedures for traffic incident classes, as outlined below, should be implemented when possible.

1. Minor Traffic Incidents (Less than 30 Minutes)

- Safety lights shall be activated.
- When a minor traffic incident blocks a travel lane, it should be removed from the lane to the shoulder as quickly as possible.
- Diversion of traffic into other lanes is often unnecessary or may be needed on a brief basis only. It is not generally possible or practical to set up a lane closure with traffic control devices for a minor traffic incident. Traffic control is usually the responsibility of on-scene responders.

TRAFFIC INCIDENT MANAGEMENT (TIM)

2. Intermediate Traffic Incident (Between 30 minutes and 2 Hours)

- Safety lights shall be activated.
- The arrow display or variable message board (VMS) shall be activated when available.
- Cones, signs, and a flare line (when it will not constitute a fire hazard) should be placed as warning devices in addition to the lights and arrow display/VMS being activated.
- The decision to place additional traffic control devices on the roadway shall be determined by the actual traffic speed at the incident scene.
- Additional protection/warning devices should be installed. Additional protection shall include a minimum of one of the following in the priority order given:
 - a. A properly positioned Shadow Vehicle (s) shall be used. A Truck Mounted Attenuator (TMA) should be used as soon as possible.
 - b. A uniformed Law Enforcement Officer.
 - c. A second advance-warning vehicle with activated safety lights, or an arrow display/VMS, and additional cones and signs.
 - d. A trained flagger(s).

3. Major Traffic Incident (More than 2 Hours)

- Safety lights shall be activated.
- The Temporary Traffic Control should include the proper traffic diversions, tapered lane closures, and upstream warning devices to encourage early diversion for motorists to use an appropriate alternative route.
- Major traffic incidents are typically traffic incidents involving hazardous materials, fatal traffic crashes involving numerous vehicles, and other natural or man-made disasters. These traffic incidents typically involve closing all or part of a roadway facility for a period exceeding 2 hours.

TRAFFIC INCIDENT MANAGEMENT (TIM)

- A road closure can be caused by a traffic incident such as a road user crash that blocks the traveled way. Road users are usually diverted through lane shifts or detoured around the traffic incident and back to the original roadway. Planning is necessary to determine the detour route, and to install, maintain and/or operate and then remove the necessary traffic control devices when the detour is terminated. Large trucks are a significant concern in such a detour, especially when detouring them from a controlled-access roadway onto a local or arterial street.
- During traffic incidents, large trucks might need to follow a route separate from that of automobiles because of bridge, weight, clearance, or geometric restrictions. In addition, vehicles carrying hazardous material, might need to follow a separate route from other vehicles.
- Some traffic incidents such as hazardous material spills might require the closure of an entire highway. Through road users must have adequate guidance around the traffic incident.
- The establishment, maintenance, and prompt removal of lane diversions can be effectively managed through a coordinated interagency traffic incident management plan that involves representatives of highway and public safety agencies.
- If the traffic incident is anticipated to last more than 24 hours, applicable procedures and devices set forth in both the **NJDOT Work Zone Safety Set-up guide**, and **Part 6 of the current MUTCD**, should be implemented.

F. Training

1. Training documentation shall comply with NJDOT's Safety Standard Operating Procedure (SOP) TRAIN.
2. Management (NJTIM) <http://www.njtim.org>

TRAFFIC SIGNALS – EMERGENCY LAMPOUT

1. Emergency Electrical Maintenance Operation is classified as an unplanned, emergency repair and may use a minimum number of traffic control devices.
2. When operation exceeds the 30-minute time frame, additional devices should be used, as soon as possible, consistent with traffic incident management categories.
3. An emergency repair is defined as work, performed on an Electrical Maintenance device, necessary to repair damage resulting from a vehicle collision, failed component, or storm damage.
4. Whenever possible, work should be performed off the traveled roadway.
5. Traffic control, in this order of preference, should be used:
 - Uniformed law enforcement officer with vehicle lights activated.
 - Properly Positioned Shadow Vehicle(s) shall have activated high-intensity rotating, flashing oscillating or strobe lights.

Reference the Traffic Incident Management section.

