Course Name

Work Area Protection

Course Objective

Upon completion of this course, trainees should be familiar with work area protection requirements, be able to set up a proper work zone, and demonstrate proper flagging procedures.

Introduction

Powerline work frequently involves working on or near roadways. Work area protection is important for the safety of workers and the public and can be challenging as work areas frequently change. A crew may begin the day working on a busy highway and transition to an isolated rural area in the afternoon. Certain jobs, such as pulling wire over an interstate, require a great deal of work area protection.

Methods used for work area protection also vary. Some jobs may require the use of a third party or law enforcement for work area protection and traffic control while others may require simple traffic control devices such as traffic cones.

Work area protection requirements are generally based on the Manual of Uniform Traffic Control Devices issued by the Federal Highway Administration but may vary by state, county, and city.

IMPORTANT	****Work zones are not barriers and will not stop motorists.**** Workers should utilize the following best practices for worker protection: • Realize you cannot control actions of the public but can protect yourself. • Position equipment not in use on the jobsite between workers and oncoming traffic. • Be constantly aware of your body position in relation to oncoming traffic. • Give flaggers an extra means of alerting workers in case of an emergency. A whistle is a good example.

Work Zone Setup

Safely working around public roadways requires an understanding of how to set up a proper work zone. One important thing to remember when working in a work zone is that traffic control devices serve as *warnings* to motorists but will not stop vehicles from entering work zones. Workers should stay alert, be cognizant of traffic, and avoid positioning themselves between fixed objects in work zones and oncoming traffic.

Safely setting up, maintaining, and removing a work zone involves:

- Identifying work zone requirements.
- Establishing the work zone.
- Maintaining the work zone.
- Removing the work zone.

Identifying Work Zone Requirements

Before any work is started work zone requirements must be identified. Many of these considerations such as involvement of law enforcement should be made well in advance of starting a job. To set up a proper work zone, take into consideration the type of work to be performed, the type of roadway involved, pedestrians, speed limits, traffic volume, time of day, flagger requirements, and conditions that may change during the course of the job. After identifying work zone requirements, it is time to layout and set up the work zone.

Establishing the Work Zone

In order to establish a safe and effective work zone, it is necessary to understand the basic components of a work zone and installation procedures for traffic control devices. The work zone, or traffic control zone, is the distance between the first advance warning sign and the point beyond the work area where traffic is no longer affected.

A traffic control zone consists of an Advanced Warning Area, Transition Area, Activity Area, and Termination Area.

- **Advance Warning Area** that tells traffic what to expect ahead. The distance from the first sign to the start of the transition area should be long enough to give motorists adequate time to respond to the conditions. Guidelines to determine how far to locate sign(s) from the truck on the end of the traffic taper and for minimum distances between warning signs are indicated in Sign Spacing figure. (Sign spacing should be at least one block for urban streets.)

Spacing of Warning Signs			
Road Type	Distance Between Signs		
	Point of Restriction to First Sign	Distance Between First and Second Signs	Distance Between Second and Third Signs
Urban (35 mph or less)	100 feet	100 feet	100feet
Urban (36 mph or more)	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2.640 feet

- **Transition Area** that moves traffic out of its normal path. The length of taper to close a lane is determined by the speed of traffic and the width of the lane to be closed (the lateral distance that traffic is shifted). If restricted sight distance is a problem, the taper should begin well in advance of the view of the obstruction. Following is a table of taper lengths, the recommended number of devices, and the spacing of channelizing devices for various speeds and lane widths.

TAPER LENGTHS*

Speed (MPH)	Lane Width (feet) 10	11	12	14	# of Devices**	Spacing between Devices (ft.)
					Assuming 12 foot lane width	
25	105	115	125	150	6	25
35	205	225	245	290	8	35
45	450	495	540	630	13	45
55	550	605	660	770	13	55
65	650	715	780	910	13	65

- **Activity Area** where the work takes place. The activity area must include work space set aside for workers, equipment, and materials and a buffer space to provide protection for traffic and workers. The buffer space must be large enough to keep traffic out of the work space.
    - Buffer Space is an optional feature in the activity area that separates traffic flow from work activity. No work activity or storage of equipment or materials should occur in this space.
- **Termination Area** that lets traffic resume normal path and flow.

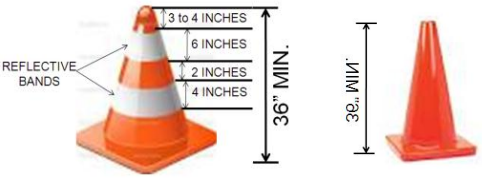
Traffic Control Devices

Cones

Cones should be spaced so that they make it apparent that the roadway or work area is closed to traffic. Their function is to warn road users of conditions created by work activities on or near a roadway and to guide road users. Cones should crashworthy, reflective (for night use), and properly spaced. The maximum distance in feet between devices in a taper should not exceed 1.0 times the speed limit in mph.

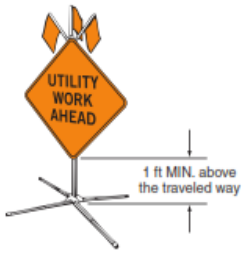
Channelizing Device Spacing

Work Zone Location	Posted Speed Limit	Spacing
In Transitions and Curves	35 mph or less	20'
Parallel to the Travelway	35 mph or less	40'
Spot Construction Access*	35 mph or less	80'
In Transitions and Curves	Greater than 35 mph	40'
Parallel to the Travelway	Greater than 35 mph	80'
Spot Construction Access*	Greater than 35 mph	120'



Signs

Warning signs in temporary traffic control zones notify road users of specific situations or conditions on or adjacent to a roadway that might not otherwise be apparent. They are used to guide drivers through a traffic control zone. Sign requirements include:



- Warning signs must be diamond-shaped with a black symbol or message and border on an orange background.
- Advance warning signs for higher-speed locations shall have a size of 48 in x 48 in. Where speeds and volumes are moderately low, a minimum size of 36 in x 36 in may be used for advance warning signs.
- Portable supports may be used for intermediate and short-term projects. Signs mounted on portable supports shall be no less than one foot above the traveled way, and shall not be located on sidewalks, bicycle lanes or areas designated for pedestrian or bicycle traffic.
- Signs should normally be located on the right side of the roadway.

Spacing of Warning Signs			
Road Type	Distance Between Signs		
	Point of Restriction to First Sign	Distance Between First and Second Signs	Distance Between Second and Third Signs
Urban (35 mph or less)	100 feet	100 feet	100 feet
Urban (36 mph or more)	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	1,000 feet	1,500 feet	2.640 feet

Installation of Traffic Control Devices

1. Locate the beginning of Work Space and mark the location (when using paint, use white or pink colors only, as other colors have designations for the type of utility being marked).
2. From the beginning of the Work Space, measure the buffer distance (empty space in advance of the work area) and mark the beginning of the Buffer Space.
3. From the beginning of the Buffer Space, measure the taper length and mark the beginning of the taper.
4. From the beginning of the taper, measure the advance warning sign spacing distances and mark each location.
5. Install advance warning signs in Advanced Warning Area, beginning with signs located on the right shoulder first, then signs on the left shoulder if applicable:
   - 1st sign—Attracts the driver's attention.
   - 2nd sign—Shows what the driver is approaching.
   - 3rd sign—Shows the driver what must be done.
6. Install traffic control devices in the Transition Area with the flow of traffic.
7. Install traffic control devices along the Activity Area:
   - Start installing along the Buffer Space with the flow of traffic
   - Continue placing devices along the Work Space.
8. Install traffic control devices for the Termination Area with the flow of traffic.
9. Inspect the work zone. A best practice is to perform a drive-thru test of the work zone to evaluate its effectiveness. If any deficiencies are discovered, they should be corrected immediately and the work zone should be re-inspected.
10. Observe motorists driving through the work zone to look for trends in motorist difficulty in maneuvering through the work zone.

Removing Traffic Control Devices

1. Remove devices from the Termination Area against the flow of traffic.
2. Remove devices from the Activity Area against the flow of traffic:
   - Make sure Work Space is clear and cleaned before removing devices.
   - Remove devices from the Buffer Space.
3. Remove devices from the Transition Area against the flow of traffic.
4. Remove advance warning signs in the Advance Warning Area against the flow of traffic. Remove the first advance warning sign last.

Keep in mind workers are at the greatest risk when installing and removing traffic control devices as the work zone has not been fully established. It is a good practice to use a spotter while installing and removing traffic control devices.

Work Area Protection from Manual of Uniform Traffic Control Devices

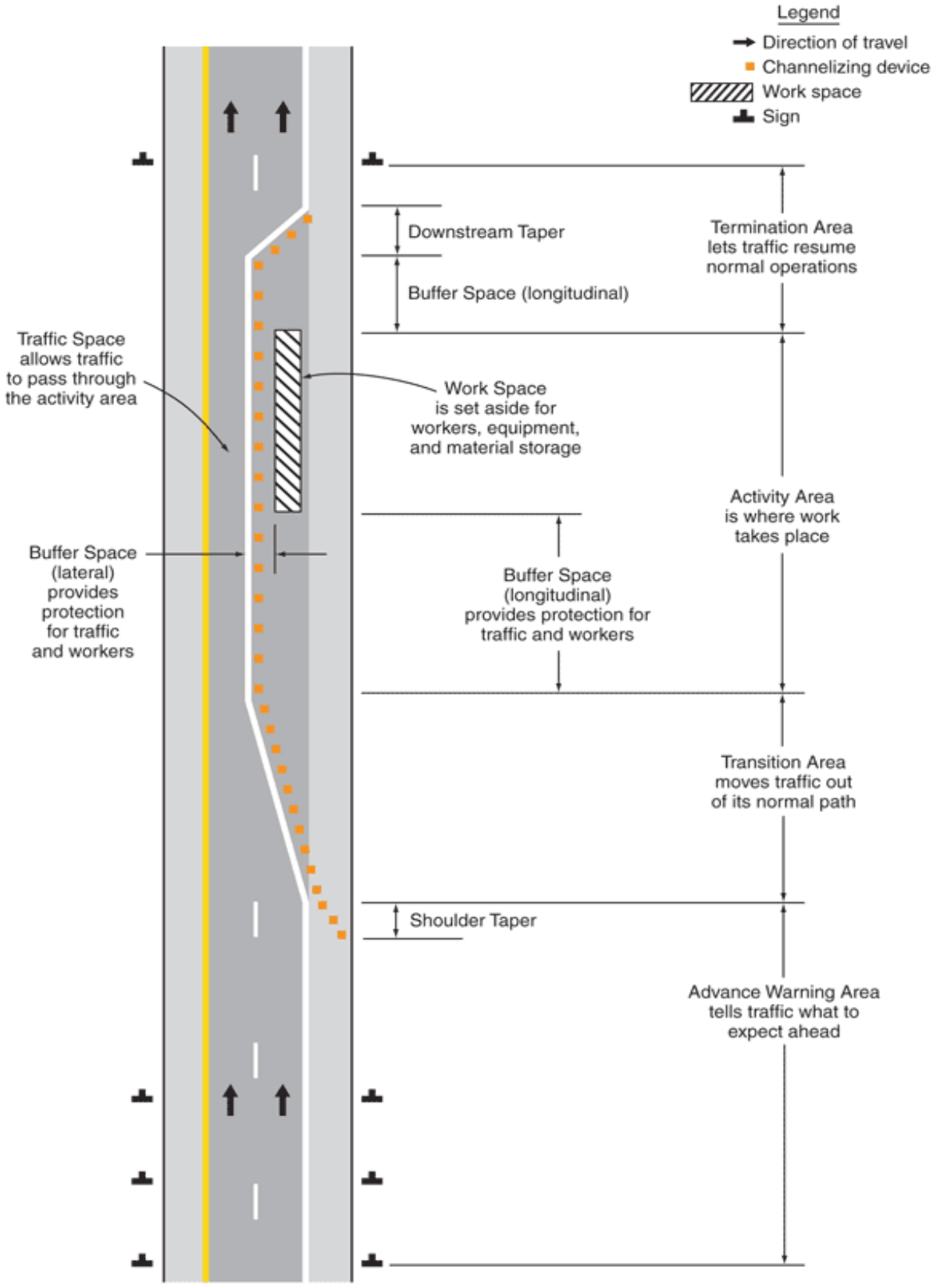


Figure 6C-3. Example of a One-Lane, Two-Way Traffic Taper

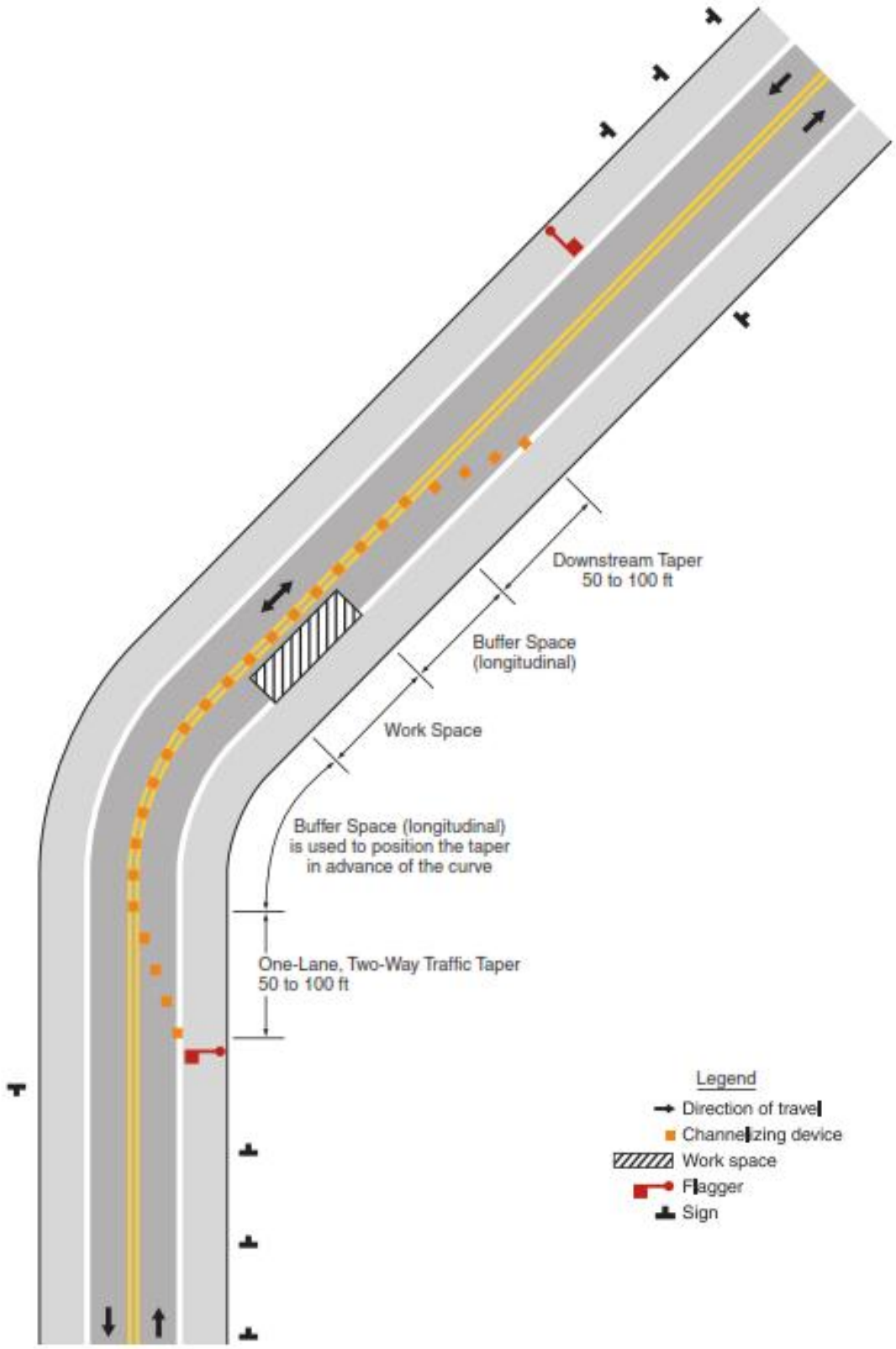


Figure 6H-10. Lane Closure on a Two-Lane Road Using Flaggers (TA-10)

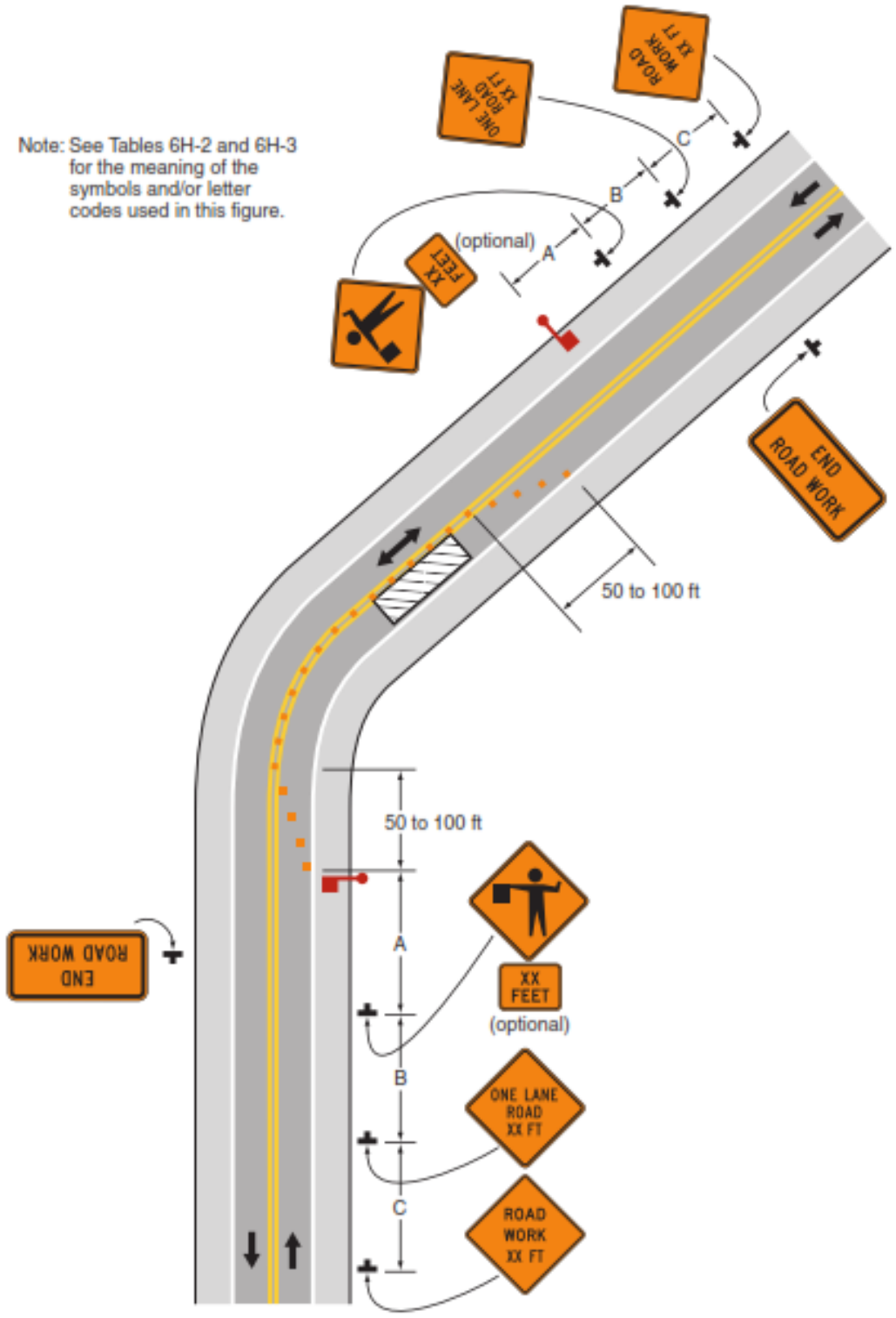
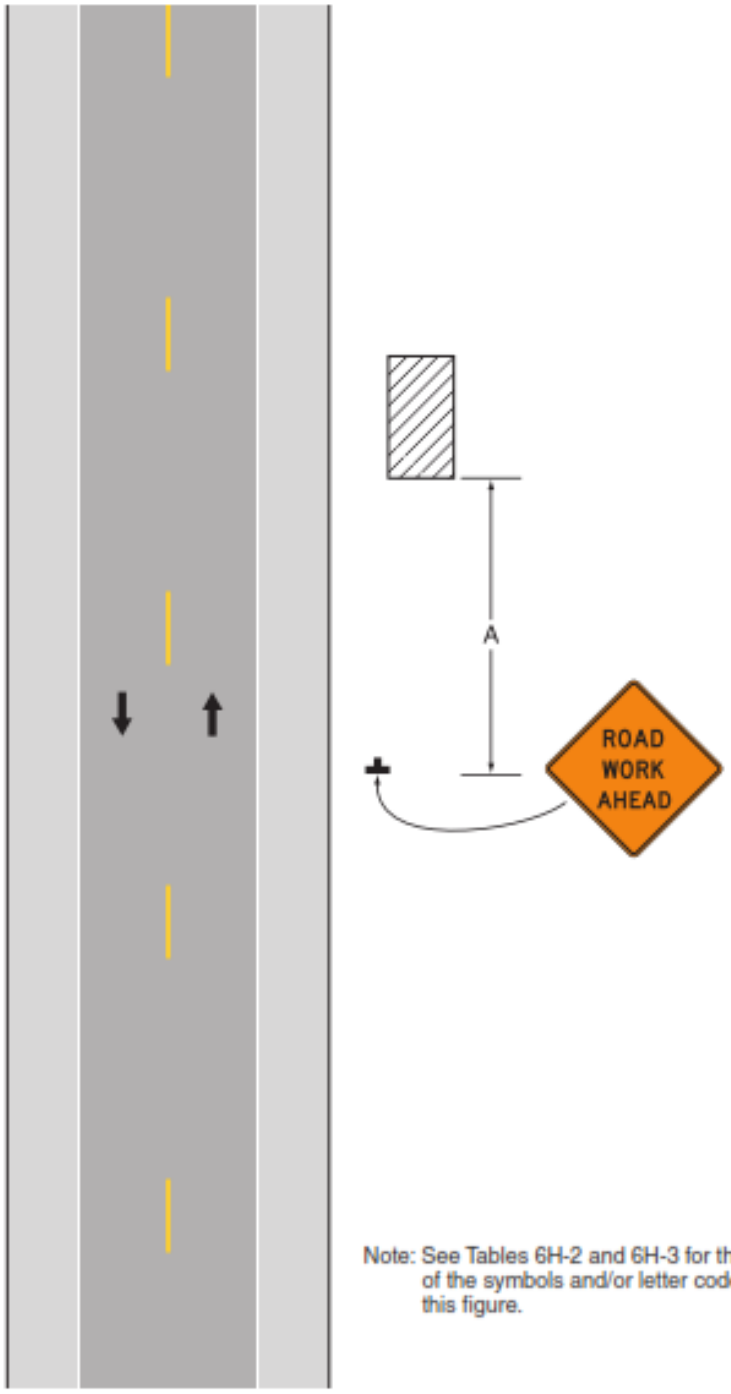


Figure 6H-1. Work Beyond the Shoulder (TA-1)



Note: See Tables 6H-2 and 6H-3 for the meaning of the symbols and/or letter codes used in this figure.

Flagging

Flaggers play a critical role in work area protection. They are used to direct and control traffic around and through work zones. Their goals are to reduce confusion, make traffic flow safely, and improve public relations. As they are responsible for worker and public safety, flaggers must be trained in traffic control procedures and safe work practices. Specific requirements for flagger training vary by state and locality. Here are some guidelines all flaggers should follow.

Who and What Depends on Flaggers?

- Workers
- Family Members
- Equipment
- Motorists
- Children
- Transportation System
- Pedestrians
- Bicyclists

In short, flaggers have an impact on everyone and everything using roadways.

Qualifications

Flaggers must have the ability to:

- Receive and communicate specific instructions clearly, firmly, and courteously.
- Move and maneuver quickly in order to avoid danger from errant vehicles.
- Control signaling devices such as paddles and flags in order to provide clear and positive guidance to drivers approaching a work zone in frequently changing situations.
- Understand and apply safe traffic control practices, sometimes in stressful or emergency situations.
- Recognize dangerous traffic situations and warn workers in sufficient time to avoid injury.

Flaggers should have:

- A sense of responsibility for safety of public and workers.
- Adequate training in safe temporary traffic control practices.
- Intelligence.
- Good physical conditioning including sight, mobility, and hearing.
- Mental alertness and the ability to react in an emergency.
- A courteous, but firm manner.
- A neat appearance.

ABCs of Flagging

Advance warning signs:
- Utility Work Ahead.
- Right/Left Lane Closed / One Lane Road Ahead.
- Flagger Ahead or Flagger Symbol.

Be visible and alert at all times:
- Proper flagging equipment.
- Watch your surroundings continually.

Control traffic with the proper procedures:
- Eye contact.
- Proper commands without confusing the driver.

Flagger Stations

When setting up a flagging station, try to locate the most visible location for the flagger to be positioned. Take into account factors that affect visibility such as hills, curves, obstructions, shade, color contrast, bad weather, darkness, other workers, traffic volume and speed, vehicle weights, pedestrians, cyclists, and type of road.

- The flagger should stand either on the shoulder adjacent to the road user being controlled or in the closed lane prior to stopping road users.
- A flagger should only stand in the lane being used by moving road users after road users have stopped.
- The flagger should be clearly visible to the first approaching road user at all times. The flagger also should be visible to other road users.
- The flagger should be stationed sufficiently in advance of the workers to warn them of approaching danger by out-of-control vehicles.
- The flagger should stand alone, away from other workers, work vehicles, or equipment.
- **Flagger stations shall be located such that approaching road users will have sufficient distance to stop at an intended stopping point.**
- Flagger stations should be located such that an errant vehicle has additional space to stop without entering the work space. The flagger should identify an escape route that can be used to avoid being struck by an errant vehicle.
- Except in emergency situations:
  - Flagger stations shall be preceded by advanced warning signs.
  - Flagger stations shall be illuminated at night.

Stopping Sight Distance as a Function of Speed

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

Flaggers should also remember driver's ability and judgment can be impaired by alcohol and/or drugs, unfamiliarity with the road, level of experience, level of attention, and health.

Flagging Procedures

Flaggers should be trained in and adhere to proper flagging procedures. They must wear high visibility safety apparel. Requirements may vary by state and conditions such as darkness but at a minimum flaggers are required to have an approved traffic vest. Remember high visibility safety apparel is considered PPE and PPE should never be altered in any way.

STOP and SLOW Paddles
STOP and SLOW paddles are the primary and preferred hand signaling devices and must be used if available. The following methods of signaling with sign paddles should be used:

To STOP traffic - The flagger shall face traffic and extend the "STOP" sign paddle in a stationary position with the arm extended horizontally away from the body. The free arm is raised with the palm toward approaching traffic.

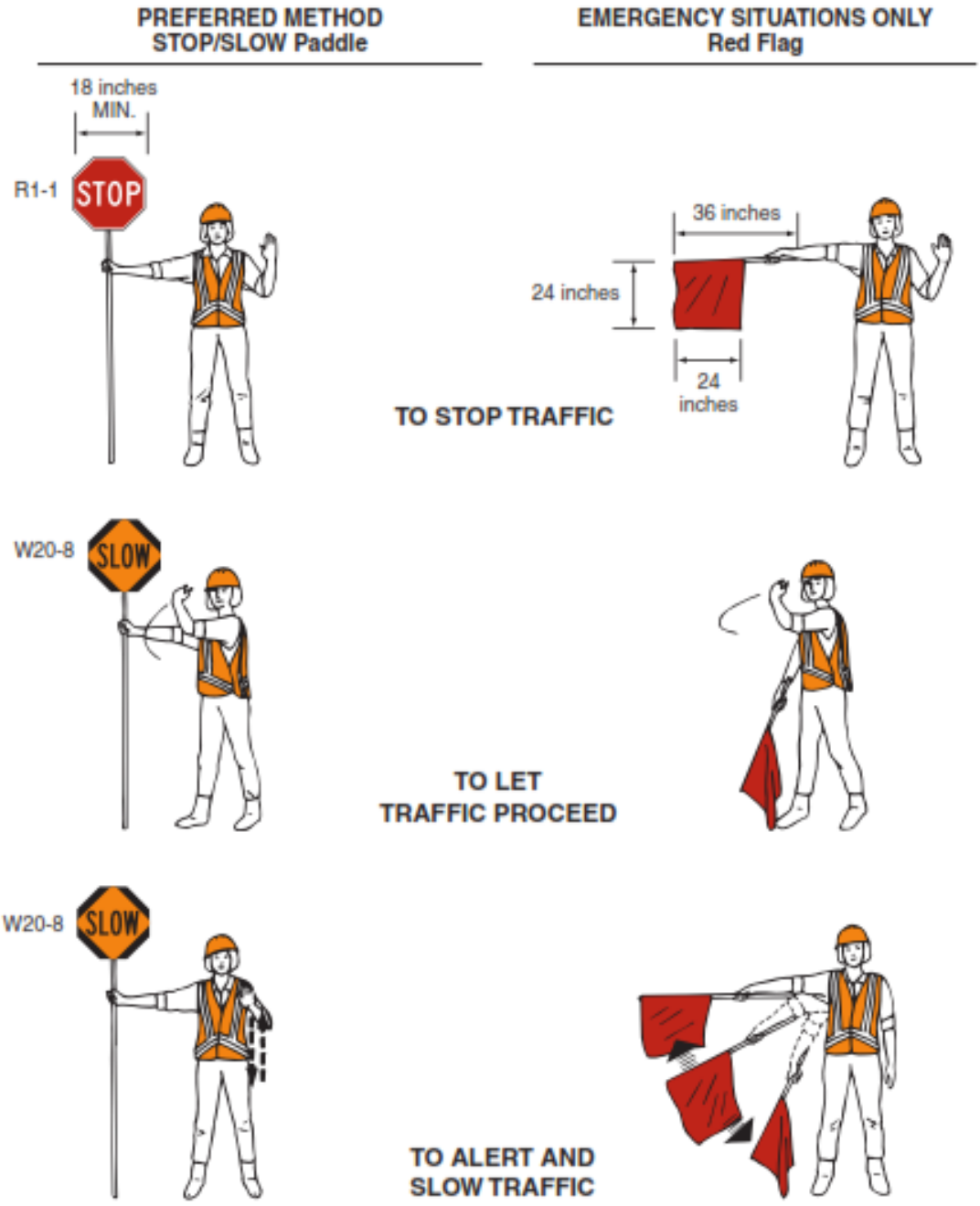
When it is safe for traffic to proceed, the flagger shall face traffic with the "SLOW" sign paddle held in a stationary position with the arm extended away from the body. The flagger motions traffic ahead with the free hand.

The free hand should also be used to motion traffic to slow down.

When it is desired to alert or slow traffic, the flagger shall face traffic with the "SLOW" sign paddle held in a stationary position with the right arm extended horizontally away from the body.

Flagging from Manual of Uniform Traffic Control Devices

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



Flags

Flags shall be used in emergencies and only if paddles are not available. When utilizing a flag, the following methods of signaling with a flag should be used:

To STOP traffic, the flagger should face traffic and extend the flag horizontally across the traffic lane in a stationary position so that the full area of the flag is visible hanging below the staff. For greater emphasis, the free arm may be raised with the palm toward approaching traffic.

When it is safe for traffic to proceed, the flagger shall stand parallel to the traffic movement, and with flag and arm lowered from view of the driver, motion traffic ahead with the free arm. Flags shall not be used to signal traffic to proceed.

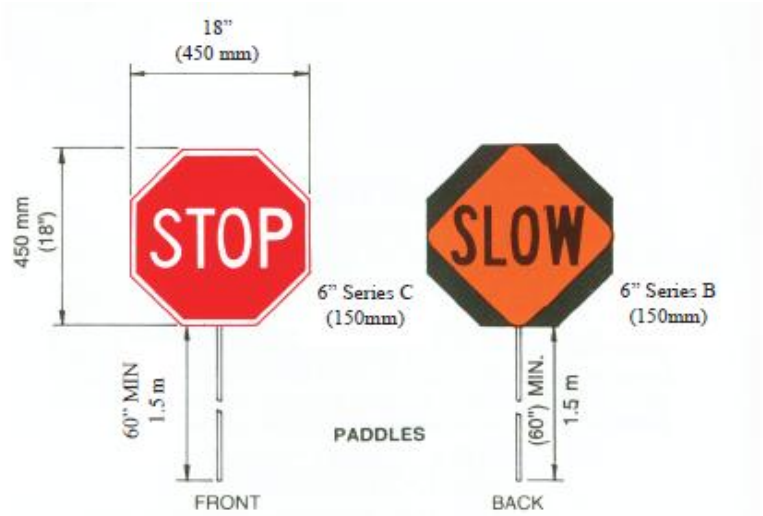
Where it is desired to alert or slow traffic by means of flagging, the flagger shall face traffic and slowly wave the flag in a sweeping motion of the extended arm from the shoulder level to straight down without raising the arm above a horizontal position.

Dos and Do Not's of Flagging	
Do	Do Not
- DO Be alert at all times. An alert flagger will more likely command the respect of motorists and will be more able to respond to emergency situations. - DO Wear proper PPE while on duty. - DO Stand alone where you can be identified by the motorists. - DO Have knowledge of the project's traffic plans. - DO Plan and prepare an escape route. - DO Treat each driver with courtesy. - DO Remove, fold over, or turn away the flagger sign and other inappropriate signs, when flagging is no longer being performed or during breaks of extended periods (ie: lunch). - DO Illuminate your flagger station during dusk or night time operations. - DO When in doubt, stop traffic to maintain control. - DO Always carry your flagging card while on flagging duty.	- DO NOT Stand in an open traffic lane or with your back to traffic. - DO NOT Stand with a group of people or near equipment or vehicles. - DO NOT Place the staff inside a cone. The staff should always be held by the flagger. - DO NOT Take part in unnecessary conversation with workers, pedestrians, or motorists. - DO NOT Use vehicle radios for communication between flaggers. - DO NOT Give flagging instructions contrary to traffic control devices. - DO NOT Read, use cell phone, or listen to music while on duty. - DO NOT Leave your station until properly replaced except to avoid imminent danger. - DO NOT Sit while performing your duty. - DO NOT Lean on vehicles or argue with motorists.

Traffic Control Device Requirements

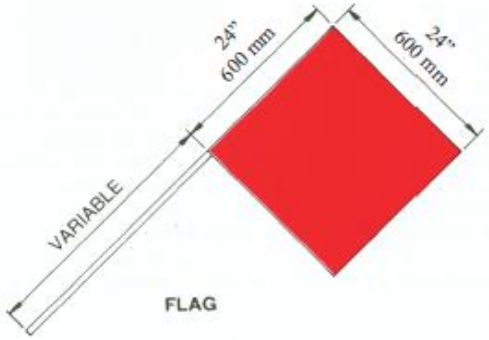
Paddles must be:

- Octagonal shaped
- 18 in. wide (minimum)
- Letters must be 6 in. tall
- Stop shall have White Letters, White Border and Red Background
- Slow shall have Black Letters, Black Border and Orange Background.
- Retroreflective during night operations
- Rigid handle on staff that is high enough to be seen by approaching or stopped traffic.



Flags must be:

- 24 in. square.
- Attached to a 36 in. staff.
- Retroreflective during night operations.
- Construction red in color.
- Used only during an emergency.



Note:
The content of this course provides general guidance on work area protections based on the Manual of Uniform Traffic Control Devices of the Federal Highway Administration. Be familiar with Company, local, state, and other requirements for work area protection based on the work being performed.

Definitions

Term	Definition
Work Area Protection	The safeguarding or protecting of pedestrians, motorists, utility workmen, and equipment by the use of barriers, warning signs, lights, flags, traffic cones, barricade ropes, flagmen, etc. on approaches to work areas.
Advisory Speed	Recommended speed for all vehicles operating on a section of highway and based on the highway design, operating characteristics, and conditions.
Alley	A street or highway intended to provide access to the rear or side of lots or buildings in urban areas and not intended for the purpose of through vehicular traffic.
Approach	All lanes of traffic moving toward an intersection or a midblock location from one direction, including any adjacent parking lane(s).
Flagger	A person who actively controls the flow of vehicular traffic into and/or through a temporary traffic control zone using hand-signaling devices or an Automated Flagger Assistance Device (AFAD).
Freeway	A divided highway with full control of access.
Highway	A general term for denoting a public way for purposes of vehicular travel, including the entire area within the right-of-way.
Opposing Traffic	Vehicles that are traveling in the opposite direction. At an intersection, vehicles entering from an approach that is approximately straight ahead would be considered to be opposing traffic, but vehicles entering from approaches on the left or right would not be considered to be opposing traffic.
Posted Speed Limit	A speed limit determined by law or regulation and displayed on Speed Limit signs.
Roadway	That portion of a highway improved, designed, or ordinarily used for vehicular travel and parking lanes, but exclusive of the sidewalk, berm, or shoulder even though such sidewalk, berm, or shoulder is used by persons riding bicycles or other human-powered vehicles.
Rural Highway	A type of roadway normally characterized by lower volumes, higher speeds, fewer turning conflicts, and less conflict with pedestrians.
School Zone	A designated roadway segment approaching, adjacent to, and beyond school buildings or grounds, or along which school related activities occur.

Term	Definition
Sign	Any traffic control device that is intended to communicate specific information to road users through a word, symbol, and/or arrow legend. Signs do not include highway traffic signals, pavement markings, delineators, or channelization devices.
Traffic Control Device	A sign, signal, marking, or other device used to regulate, warn, or guide traffic, placed on, over, or adjacent to a street, highway, private road open to public travel, pedestrian facility, or shared-use path by authority of a public agency or official having jurisdiction, or, in the case of a private road open to public travel, by authority of the private owner or private official having jurisdiction.
Urban Street	A type of street normally characterized by relatively low speeds, wide ranges of traffic volumes, narrower lanes, frequent intersections and driveways, significant pedestrian traffic, and more businesses and houses.
Worker	A person on foot whose duties place him or her within the right-of-way of a street, highway, or pathway, such as street, highway, or pathway construction and maintenance forces, survey crews, utility crews, responders to incidents within the street, highway, or pathway right-of-way, and law enforcement personnel when directing traffic, investigating crashes, and handling lane closures, obstructed roadways, and disasters within the right-of-way of a street, highway, or pathway.

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Work Zone Traffic Safety

Employees being struck by vehicles or mobile equipment lead to many work zone fatalities or injuries. Work zones need traffic controls identified by signs, cones, barrels and barriers.

Drivers, employees on foot, and pedestrians must be able to see and understand the proper routes. Construction project managers determine traffic control plans within construction/demolition worksites.

- Traffic control devices, signals, and message boards instruct drivers to follow paths away from where work is being done.
- Approved traffic control devices, including cones, barrels, barricades, and delineator posts are also used inside work zones.

Work Zone Protections: Various concrete, water, sand, collapsible barriers, crash cushions, and truck-mounted attenuators can help limit motorist intrusions into construction work zones.

Flagging: Flaggers should wear high visibility clothing with a fluorescent background and made of retroreflective material. This makes employees visible for at least 1,000 feet in any direction. Check the label or packaging to ensure that the garments are performance class 2 or 3. Drivers should be warned with signs that there will be flaggers ahead. Flaggers should use STOP/SLOW paddles, paddles with lights, or flags (only in emergencies).

Lighting: Flagger stations should be illuminated. Lighting for employees on foot and for equipment operators should be at least 5 foot-candles or greater. Where available lighting is not sufficient, flares or chemical lighting should be used. Glare should be controlled or eliminated.

Training: Flaggers must be trained/certified and use authorized signaling methods.

Driving: Seat belts and rollover protection should be used on equipment and vehicles as the manufacturer recommends.

For more complete information:

OSHA Occupational Safety and Health Administration
U.S. Department of Labor
www.osha.gov (800) 321-OSHA

OSHA 3284-05R-07