



# Work Zone Traffic Safety

Road construction workers on both highways and city streets are at risk of fatal or serious injuries. The majority of road work takes place in congested areas with exposure to high traffic volumes and speeds. Workers may also deal with low lighting, low visibility, and inclement weather conditions. Moving construction vehicles and passing motor vehicle traffic can both cause problems for road construction workers. This course discusses important ways to protect yourself, your co-workers, pedestrians, and motorists in a road construction zone.

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# OSHAcademy Course 612 Study Guide

## Work Zone Traffic Safety

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This study guide is designed to be reviewed off-line as a tool for preparation to successfully complete OSHAcademy Course 612.

Read each module, answer the quiz questions, and submit the quiz questions online through the course webpage. You can print the post-quiz response screen which will contain the correct answers to the questions.

The final exam will consist of questions developed from the course content and module quizzes.

We hope you enjoy the course and if you have any questions, feel free to email or call:

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## Course Introduction

Construction contractors, contracting agencies, and others responsible for work zone safety face the challenge of providing a safe workplace while ensuring the safe movement of the public through the work zone. Highway and street construction presents a complex work situation in which workers face multiple injury risks under conditions that may change without warning.

This training conforms with OSHA's recommendation that training should focus on identifying recognized hazards, analyzing the causes of accidents, and controlling hazards to prevent accidents. OSHA does not want safety training to focus only on its rules. If you are an employer, it is your responsibility to provide additional training for workers on the specific hazards of their job as noted in [OSHA Pub 2254, Training Requirements in OSHA Standards](#) and specific work zone rules in your state. If you are an employee, it is your responsibility to comply with your employers safety policies, procedures, and rules.

OSHA holds employers accountable to provide additional training for workers on specific hazards of their job as noted in [OSHA Pub 2254, Training Requirements in OSHA Standards](#) and specific work zone rules in your state. If you are an employee, it is your responsibility to comply with your employers safety policies, procedures, and rules.

Because interpretations and enforcement policy may change over time, consult current regulations for additional guidance compliance requirements.

### Regulations

- OSHA construction rules within industry standard, [1926, Subpart O](#), address operation of vehicles and equipment within an off-highway job site not open to public traffic. However, Subpart O is not exhaustive in its coverage of machinery types or safety equipment, nor does it address work practices, traffic control plans, or shift work.
- Flagging and signaling practices covering signs, signals, and barricades, are discussed in general terms in [1926 Subpart G](#). Subpart G defers to the U.S. Department of Transportation's "[Manual on Uniform Traffic Control Devices MUTCD](#)" on matters relating to hand signals, barricades, and traffic control devices.
- You can learn more about the laws applicable to work zones in your state at the [National Work Zone Safety Information Clearinghouse](#).

## Module 1: Work Zone and Roadway Risks

On average, over 700 fatalities occur in work zones each year. Commercial motor vehicle (CMV) and passenger vehicle drivers both need to be particularly careful while traveling through work zones. Trucks and buses have limited maneuverability and large blind spots, both of which make operating in these areas more challenging for them. In fact, large trucks are disproportionately involved in work zone crashes.

### Risks in and Around Work Zones

Workers in highway work zones are most often exposed to risk to injury from the movement of construction vehicles and equipment within and around work zones.

1. Highway workers routinely work close to construction vehicles and motor vehicle traffic.
2. Highway workers work in conditions of low lighting, low visibility, and inclement weather, and may work in congested areas with exposure to high traffic volume and speeds.
3. Vehicle or equipment operators risk injury due to overturn, collision, or being caught in running equipment.
4. Flaggers and other workers on foot are exposed to the risk of being struck by traffic vehicles or construction equipment most often if they are not visible to motorists or equipment operators.

**1. What is a major reason for the increased risk of getting hit or run over in a construction work zone?**

- a. Lack of visibility
- b. Excessive speed of vehicles
- c. Confusion in directing traffic
- d. Non-compliance with warning signs

### Traffic Control Plans

A traffic control plan helps move motorist traffic safely through or around roadway work zones to protect the public and workers. The traffic control plan makes use of traffic control devices, standard signage, and buffer and transition zones. When flaggers will be used on a job lasting more than one day, there must be a current site-specific traffic control plan kept on site. There are two types of traffic control plans: Temporary and Internal. The type of work you're doing will define exactly which type of traffic control plan you need.

## Temporary Traffic Control Plans (TTCPs)

Temporary Traffic Control Plans (TTCPs) are designed to assist road users by providing appropriate visual cues and guidance. In the Temporary Traffic Control zone, construction vehicles and equipment moving inside create a risk to workers on foot.

**Activity Area.** The Temporary Traffic Control activity area is the section of the highway where the work activity takes place. It is comprised of the work space, the traffic space, the buffer space, and the incident management vehicle storage space. Click on the button below to see more information on activity area spaces.

Spaces within the activity area

1. **Work Space.** The work space is that portion of the roadway closed to traffic and set aside for workers, equipment, and material. Work space may be fixed or may move as work progresses. Long-term work spaces are usually delineated by channelizing devices or shielded by barriers to exclude traffic and pedestrians. the Internal Traffic Control Plan covers safety inside the work space.
2. **Traffic Space.** The traffic space is the portion of the roadway in which traffic is routed through the activity area.
3. **Buffer Space.** The buffer space is an optional feature in the activity area that separates traffic flow from the work activity or a potentially hazardous area and provides recovery space for an errant vehicle.
4. **Incident Management Vehicle Storage Space.** When work occurs on a high-volume, highly congested facility in an urban area, it is optional to allow space to store emergency vehicles (e.g., tow trucks) to respond quickly to traffic incidents.

Actions to consider when developing and implementing a TTCP.

1. Restrict personnel access points into work areas and define/designate "no backing zones" and "pedestrian-free zones."
2. Design into the Temporary Traffic Control Plan flow paths for equipment and vehicle traffic to minimize backing maneuvers where possible. There should also be buffer spaces to protect pedestrian workers from straying traffic vehicles and/or work zone equipment.
3. Establish procedures for entering and exiting the work zone.
4. Train all employees on the Temporary Traffic Control Plan and its precautionary measures.

Examples of TTCP strategies to consider for operations:

1. Facility Closure: full, partial, short term, ramps, approaches, detours, alternate routes
2. Reduced shoulder and lane widths to maintain number of lanes
3. Reduced length of work zone lane closures or impact area, segmenting work zone
4. Lane closure to provide worker safety, increased lateral buffer
5. Vehicle restrictions (trucks, oversize, local traffic, etc.)
6. Emergency vehicle access
7. Emergency pullouts for disabled vehicles or enforcement

### **Internal Traffic Control Plans (ITCPs)**

In contrast to a TTCP, an internal traffic control plan (ITCP) addresses hazards inside the activity area workspace of a temporary traffic control zone. The objective of the ITCP is to provide a safe traffic pattern and access plan for the contractor, equipment and materials, and improving the overall safety of the work zone. The ITCP is developed by the Contractor prior to beginning work on the project.

The ITCP should include internal haul routes, work zone access points, and should consider the following:

1. Reduce equipment back-ups.
2. Limit contractor access points within the work zone. Attention should be given to ingress and egress locations.
3. Establish pedestrian and worker free areas where possible.
4. Establish work zone layouts appropriate for the work type being performed.
5. Provide signs within the work zone to give guidance to workers, equipment, trucks, and drivers.
6. Evaluate acceleration / deceleration areas.
7. Design buffer spaces to protect workers from errant vehicles or equipment.
8. Establish a maintenance plan for temporary traffic control devices.
9. Brief truck drivers on access and internal paths to follow within the site.

10. Review and update the ITCP on a regular basis at project safety meetings throughout the life of the project.
11. A designated person monitors and corrects non-compliant behavior.

**2. Which traffic control plan is designed primarily to protect workers inside the workspace of a work zone activity area?**

1. A Vehicle Operations Control Plan (VOCP)
2. A Temporary Traffic Control Plan (TTCP)
3. An Internal Traffic Control Plan (ITCP)
4. A Work Zone Control Plan (WZCP)

### Risk Factors in the Work Zone

Flaggers, equipment operators, and other workers-on-foot (refers to any pedestrian worker on the ground in the work zone) are exposed to several risks, including being hit if they are not visible to vehicle or heavy equipment operators.

### Equipment Operator Risk Factors

Workers who operate construction vehicles or motorized equipment have an increased risk of injury due to rollovers, collisions, and being caught between or struck by operating equipment. Drivers experiencing long delays become impatient and can act unpredictably increasing worker exposure. Other driver conditions include drivers that are impaired, drowsy, distracted, or aggressive. Active work should not take place with traffic on both sides of the workers, on the same roadbed, unless there is positive protection.

### Traffic Control in Work Zones

Flaggers and other workers assigned to traffic control responsibilities in the work zone work very close to motor vehicles and heavy equipment. This is a major reason for an increased risk of workers getting hit or run over. Therefore, they must be trained in traffic control techniques. Examples of conflicts for drivers, workers, and traffic regulators to consider when developing a TTCP include:

1. Congestion points
2. Roadway configuration, merging, tapering, and lane drops
3. Unstable traffic flow
4. Clear safety zone issues
5. Emergency vehicle access
6. Night work visibility

7. Confusing or conflicting signs, markings, and features.

**3. What is a major reason for the increased risk of getting hit or run over in a construction work zone?**

1. A lack of work zone signage
2. Workers not wearing reflective clothing
3. Working close to vehicles and equipment
4. Vehicles entering and exiting the activity area

### Work Zone Best Practices

#### Employers

Employers should conduct crew meetings and train all workers on work zone safety. They should discuss important safety topics including potential hazards, equipment blind spots, and movement precautions in the activity area.

Employers should also have the following to protect workers in a work zone:

1. a comprehensive site-specific safety program; and
2. a Temporary Traffic Control Plan (TTCP) in place for the project site.

#### Workers

Workers should do the following in an around the work zone:

1. Wear high-visibility safety apparel (vest and head gear).
2. Be alert for construction vehicles, equipment, and general traffic.
3. Check surroundings often for hazards.
4. Know the plan for traffic flow.
5. Keep a safe distance from traffic.
6. Communicate with other workers, especially when there are changes in procedures, locations, or traffic flow pattern.
7. Stay behind the protective barriers.

8. If you do not have a reason for being there, do not linger or cross into areas around moving equipment.
9. Use extra precautions and additional safety apparel at night and during poor weather conditions.
10. Reduce spacing between channelizing devices (discussed in Module 3) at night to compensate for reduced driver visibility.
11. Ensure the light levels of arrow panels are set at nighttime levels; daytime settings used at night produce blinding light.
12. Increase the size of traffic control devices, reflective material, and lettering to improve driver recognition at night.
13. Keep operators who are working near moving equipment in eye contact.
14. Remember equipment blind spots and limited visual areas.

#### **Equipment/Vehicle Operators**

1. Keep windows and mirrors clean.
2. Watch for workers on foot and know where they are located.
3. Remember equipment blind spots and limited visual areas.

<p><b>4. What should be done to improve driver recognition of directions when traveling through a work zone at night?</b></p>
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| <ol style="list-style-type: none"><li>1. Increase the number of entrances/exits to the work zone</li><li>2. Increase the light levels of arrow panels</li><li>3. Increase the spacing between channelizing devices</li><li>4. Increase the size of devices, reflective material, and lettering</li></ol> |
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#### **Risks in the Roadway**

Workers in the roadway are also at risk of injury from a variety of general traffic vehicles passing or entering the work zone, such as:

1. drivers under the influence of alcohol

2. sleepy or impaired drivers
3. impatient, upset, or reckless drivers
4. drivers using cell phones or other inattentive drivers
5. law enforcement and emergency vehicles
6. disabled vehicles pulling in and parking
7. lost drivers looking for directions

The number of work zone and roadway crashes are increasing, and the reason is clear: cell phone use is the primary cause of crashes in a large percentage of work zone and roadway incidents.

### Real-Life Accident

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An 11-person construction crew was paving the northbound side of a 6-lane interstate highway. The far left and middle lanes of the highway were closed to traffic, with two pavers operating simultaneously in staggered positions. Hot asphalt was delivered to the site in tractor-trailers which queued on the left shoulder while waiting to back up to the pavers. A 34-year-old construction laborer was positioned adjacent to the far-left lane, approximately 12 feet behind the paver's work area, shoveling old asphalt from around a catch basin. A tractor-trailer pulled away from the paver in the middle lane and began backing. The driver stopped when he heard other workers yelling. Exiting the vehicle, he found the laborer run over by the four left rear wheels. The laborer was pronounced dead at the scene [Massachusetts Department of Public Health].

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#### **5. What is the primary cause for the increase in work zone and roadway incidents?**

1. Intoxication
2. Cell phone use
3. Fatigue
4. Poor signage

### Roadway Best Practices

1. Flagging should be used only when all other methods of traffic control are inadequate to direct, or control, traffic.

2. A TCP showing flagger locations, signs and devices is required for any flagging operation no matter the duration.
3. Minimum standard flagging paddle size allowed is 18 inches. It is recommended that a 24-inch paddle be used to improve visibility.
4. In a mobile operation when the flagger is moving with the operation, all signs associated with the flagger must be moved ahead whenever work advances to more than 2 miles from the first advance warning signs.
5. A "Flagger Ahead" sign must be within 1,500 feet of the flagger and the flagger station must be able to be seen from the sign. If terrain does not allow a motorist to see the flagger from the "Flagger Ahead" sign, the distance between the sign and the flagger must be shortened to allow visual contact. The spacing must not be less than the required distance based on the highway speed.
6. During hours of darkness, flagger stations must be illuminated by using a portable light plant or balloon type lights. The flagger should be visible and discernible as a flagger from a distance of 1,000 feet.
7. Pilot car use is appropriate for long work areas to help maintain traffic speeds and to guide traffic through the work areas. Pilot car operators must be certified flaggers able to trade off duties with other flaggers.
8. When flagging at intersections, a recommended best practice is to reduce traffic approaching the intersection to a single lane whenever possible. This may require lane closures and restricting access to turn pockets with channelization devices. If signalized, the signal must be either turned off or set to all red "flash" mode. At no time will traffic be flagged with an active signal in full operation.
9. The placement of a flagger at the center of an intersection to control traffic is not allowed. The only person allowed to legally control traffic from the center of an intersection is a uniformed police officer. No matter who is performing the intersection flagging, the appropriate advance warning signing is required to be in place.
10. A four-sign sequence should be used for all flagging on roadways with posted speeds of 45 mph or higher. The "one lane road ahead" sign may need to be replaced with a more appropriate sign if flaggers are used for short traffic stops for truck crossing, tree falling, or other work and traffic will not be alternated in a single lane.

**6. For what duration must a traffic control plan that includes flagger locations, signs, and devices be implemented for a project?**

1. For the entire duration no matter how long
2. For short durations only
3. Only as needed during prior to and after a project
4. For a prolonged duration

## Module 2: Blind Spot Safety

Roadway work zones are hazardous both for motorists who drive through the complex array of signs, barrels, and lane changes and for workers who build, repair, and maintain the streets, bridges, and highways. Most worker fatalities are due to being struck by a vehicle in the work zone. Pickup trucks and SUVs accounted for 151 worker deaths at road construction sites from 2011-2017, followed by machinery (131), automobiles (129), semi-trucks (124), and dump trucks (82).

### Blind Spot Hazards

A blind spot (or blind area) is the area around a vehicle or a piece of construction equipment that is not visible to the operator, either by direct line-of-sight or indirectly by use of internal and external mirrors.

Construction equipment is typically large and has an enclosed cap. This can make the blind areas around the equipment very large and hard to see. The bigger the equipment, the larger the blind spots or hazardous areas for pedestrian and ground workers.

Here is a complete list of construction vehicles and blind area diagrams: [Construction Equipment Visibility-Diagram Lookup](#).

#### 1. What type of work zone accident accounts for most fatalities?

1. Struck by a vehicle
2. Struck by a falling object
3. Caught between a moving and stationary object
4. Caught on rotating part

### Blind Spot Hazards

Obstructions in the driver's line of sight, including mirrors, door and window posts, tools, and attachments on vehicles can create blind spots, reduce visibility, or swings that can increase the risk to workers being struck or pinned. You must know the equipment swing radius, such as how far can it reach, move, or rotate.

Ways to protect yourself when working near heavy equipment include the following:

1. Do not cross directly in front of or immediately behind large heavy equipment or trucks where the operator sits higher in the vehicle.
2. Communicate with the operator (either verbally or by eye contact) before entering any area near heavy equipment or large trucks.

3. If you have to stand near parked equipment or trucks, stand in front or on operator side. Then, if equipment comes into use, the operator can see you and you can see them.

### **Real-Life Accident**

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A 33-year-old construction laborer was working at a gravel-unloading operation at a highway construction site. His usual work assignment was to operate the generator for the conveyor system that moved gravel unloaded from belly dump trailers. A dump truck driver on the site was having difficulty opening the gates of his belly dump trailer. Attempting to assist the driver, the laborer went under the trailer to manually open the gates. The driver, not realizing the laborer was under the trailer, pulled away from the unloading platform and ran over him with the rear dual tires of the trailer. The laborer was pronounced dead at the scene [Minnesota Department of Health].

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#### **2. If you're required to be near parked equipment or trucks, where should you stand to avoid being hit or run over?**

1. Behind on the passenger side
2. In front or on operator side
3. Only directly in front of the windshield
4. In front on the passenger side

### **Operating Dump Trucks in Reverse**

According to BLS, between 2011 and 2015, of the 49 workers fatally struck by a dump truck, the dump truck was backing up in 40 cases.

If it is reasonable to expect employees will enter the backing zone, the vehicle must have an operable automatic reverse signal alarm which is both audible above the surrounding noise level and can be heard at least fifteen feet from the rear of the vehicle.

You must also have an observer who signals when it is safe to back up or stop or the vehicle has an operable device installed which gives the driver a full view of the area behind the dump truck.

## Real-Life Accident

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A laborer was backed over by a tack truck while working as a flagger on an asphalt resurfacing job in a residential roadway work zone. The victim was standing with his back to the reversing tack truck when a dump truck driver attempted to warn him by waving his arms. The tack truck struck the victim; the driver thought he had passed over a manhole cover and continued backing. The tack truck driver stopped when he saw the dump truck driver running and waving his arms in his mirror. Both drivers found the victim at the front of the tack truck lying face down on a man-hole cover on the ground.

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### **3. What must a dump truck have if it is reasonable to expect employees will enter the truck's backing zone?**

1. A barricade posted to warn workers
2. An operable automatic reverse signal alarm
3. A rear-view mirror in the cab
4. A video monitor with rear view capability

## Backing Safety Solutions

### Spotter

Spotters are a proven method of protecting employees on foot behind vehicles with an obstructed view, but spotters themselves can be at risk for injury or even death. Employers can implement the following actions to help keep spotters safe:

1. Ensure that spotters and drivers agree on hand signals before backing up.
2. Instruct spotters to always maintain visual contact with the driver while the vehicle is backing.
3. Instruct drivers to stop backing immediately if they lose sight of the spotter.
4. Do not give spotters additional duties while they are acting as spotters.
5. Instruct spotters not to use personal mobile phones, personal headphones, or other items which could pose a distraction during spotting activities.
6. Provide spotters with high-visibility clothing, especially during night operations.

**4. What should spotters use to aid in their responsibilities while spotting vehicles?**

1. Headphones
2. Mobile phones
3. Nothing
4. Signal lights

### Cameras

Most vehicles (and some types of mobile equipment) can accommodate a camera that provides operators with a view to the rear. Some vehicles come equipped with cameras or may be offered with them as optional equipment. Camera systems can also be purchased as after-market equipment for vehicles. Viewing screens may be dash-mounted but must not block the driver's view out the windshield. Harsh environments, such as some construction sites or mines, may require more rugged cameras. Determining where to mount a camera for maximum effectiveness may be difficult, especially on large vehicles. For example, dump trucks may require two or three cameras to monitor the blind spots on the front, rear, and side of the vehicle.

### Proximity Detection Systems

These systems alert the driver with a visual and/or audio warning. These systems must be positioned so that they won't detect harmless objects, such as the concrete slab of a driveway, which can interfere with the detection of an object or person behind the vehicle or mobile equipment. Like cameras, this equipment can be mounted on most vehicles and may be an option from some equipment manufacturers.

**Radar systems** transmit a signal, which is bounced off an object. The signal is then received by a receiver. The composition of an object can affect detection, with some materials being virtually invisible to radar.

**Ultrasonic systems**, such as sonar, emit bursts of ultrasonic waves in a frequency above the hearing threshold of humans. When the waves strike an object, they generate echoes used to determine the distance to the object. These systems alert the driver with a visual and/or audio warning.

**5. What is a weakness when using radar detection devices as a backup safety system?**

1. The composition of objects does not affect detection
2. Proximity systems are too expensive
3. Some materials may be invisible to detection
4. They must be positioned to detect harmless objects

**Tag-Based Systems**

Another type of proximity detection system is an electromagnetic field-based system, which is a type of tag-based system. This system consists of electromagnetic field generators and field detecting devices.

1. One electromagnetic field-based system uses electromagnetic field generators installed on a vehicle and electronic sensing devices (a tag) worn by persons working near the vehicle.
2. Another electromagnetic field-based system uses field generators worn by persons working near the vehicle, with the sensing devices installed on the vehicle.

These electromagnetic field-based systems can be programmed to warn affected workers, stop the vehicle, or both, when workers get within the predefined danger zone of the vehicle.

**6. Which of the following backing safety solutions uses electromagnetic field generators and field detecting devices?**

1. Cell-phone application system
2. Tag-Based systems
3. Visual detection system
4. A camera system

## Module 3: Signs, Signals, and Barricades

Highway, road, street, bridge, tunnel, utility, and other workers for the highway infrastructure are exposed to hazards from outside and inside the work zone. Falls, electrical, struck-by, and caught between are the common hazards found in this type of work. Guidance for the set-up of work zone signs, barricades, flagging, etc. are found in the U.S. Department of Transportation's "[Manual on Uniform Traffic Control Devices MUTCD \(PDF\)](#)." The MUTCD is referenced in [1926 Subpart G](#). OSHA also provides guidance on its [Highway Work Zones and Signs, Signals, and Barricades](#) webpage.

### Signs for Construction

Signs are the warnings of hazard, temporarily or permanently affixed or placed, at locations where hazards exist.

Signs convey both general and specific messages by means of words or symbols and must be visible at all times when work is being performed and must be removed or covered promptly when the hazards no longer exist.

#### Danger signs

Danger signs must be used only where an immediate hazard exists and must follow the specifications illustrated in Figure 1 of ANSI Z35.1-1968 or in Figures 1 to 13 of ANSI Z535.2-2011, incorporated by reference in [1926.6](#).

Danger signs must have red as the predominating color for the upper panel; black outline on the borders; and a white lower panel for additional sign wording.

#### Caution signs

Caution signs must be used only to warn against potential hazards or to caution against unsafe practices. They must follow the specifications illustrated in Figure 4 of ANSI Z35.1-1968 or in Figures 1 to 13 of ANSI Z535.2-2011, incorporated by reference in [1926.6](#).

Caution signs must have yellow as the predominating color; black upper panel and borders; yellow lettering of "caution" on the black panel; and the lower yellow panel for additional sign wording. Black lettering must be used for additional wording.

The standard color of the background must be yellow; and the panel, black with yellow letters. Any letters used against the yellow background must be black. The colors must be those of opaque glossy samples as specified in Table 1 of ANSI Z53.1-1967 or in Table 1 of ANSI Z535.1-2006(R2011), incorporated by reference in [1926.6](#).

**1. Which of the following is TRUE regarding the use of danger signs?**

1. They must be used only where an immediate hazard exists
2. They are used only to warn against potential hazards
3. They are used to give notice of an imminent danger condition
4. They have a black upper panel and yellow lettering

**Exit Signs**

Exit signs, when required, must be lettered in legible red letters, not less than 6 inches high, on a white field and the principal stroke of the letters must be at least three-fourths inch in width.

**Safety Instruction Signs**

Safety instruction signs, when used, must be white with green upper panel with white letters to convey the principal message. Any additional wording on the sign must be black letters on the white background.

**Directional Signs**

Directional signs, other than automotive traffic signs specified in paragraph (g) of this section, must be white with a black panel and a white directional symbol. Any additional wording on the sign must be black letters on the white background.

**2. Which type of sign must be lettered in legible red letters?**

1. Danger sign
2. Instruction sign
3. Exit sign
4. Directional sign

**Traffic Control Signs and Devices**

At points of hazard, construction areas must be posted with legible traffic control signs and protected by traffic control devices.

The design and use of all traffic control devices, including signs, signals, markings, barricades, and other devices, for protection of construction workers must conform to Part 6 of the [Manual on Uniform Traffic Control Devices for Streets and Highways \(MUTCD\)](#) (incorporated by reference, see [1926.6](#)).

**Accident Prevention Tags**

Tags are temporary signs, usually attached to a piece of equipment or part of a structure, to warn of existing or immediate hazards. They are used only until the identified hazard is eliminated or the hazardous operation is completed.

Accident prevention tags must be used as a temporary means of warning employees of an existing hazard, such as defective tools, equipment, etc. They must not be used in place of, or as a substitute for, accident prevention signs.

For accident prevention tags, employers must follow specifications that are similar to those in Figures 1 to 4 of ANSI Z35.2-1968 or Figures 1 to 8 of [ANSI Z535.5-2011](#), incorporated by reference in 1926.6.

**3. Accident prevention tags \_\_\_\_\_.**

1. must be written in English
2. warn employees of existing hazards
3. may be used permanently
4. may be used instead of a sign

### Signals

Signals are moving signs, provided by workers, such as flaggers, spotters, and crane/hoist signal persons. They are also provided devices, such as flashing lights, to warn of possible or existing hazards.

### Flaggers

Flaggers protect workers by providing temporary traffic control (TTC) and maintaining traffic flow through a work zone, despite a shutdown of lanes. They stop motorists from accidentally driving into the work area. Signaling by flaggers and the use of flaggers, including warning garments worn by flaggers, must conform to Part 6 of the MUTCD (incorporated by reference, see 1926.6).

### Spotters

Spotters have a different job than flaggers. They keep equipment operators in the work zone with obstructed views from backing over or running over workers they can't see. Spotters are also used when working in rough terrain areas, when performing blind lifts and when working around overhead power lines.

### Crane and Hoist Signal Persons

Signal persons are used during crane and hoist operations to transmit signals to the operator. Only one person may give signals to a crane/derrick operator at a time, though any person may give an emergency stop signal. A more complete set of signals can be found in [OSHA 1926 Subpart CC App A](#).

**4. Who keeps dump truck operators from backing over workers or hitting objects?**

1. Coworkers
2. Flaggers
3. Spotters
4. Crane/Hoist signal person

**Channelizing Devices**

**Traffic safety cones** are the most common devices used to channelize traffic, divide opposing traffic lanes, divide traffic lanes when two or more lanes are kept open in the same direction, and delineate short-duration maintenance and utility work. The minimum cone size is 18 inches tall. For speeds of 45 mph or higher, or during nighttime operations, cones must be a minimum of 28 inches tall, and have retroreflective bands.

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

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

**Traffic safety drums** are 36 inches tall and are the most dominant and preferred device for multi-lane high volume highways because they have the greatest visibility.

**Vertical flat panel devices** and **devices with directional stripe patterns** are not allowed due to frequency of placement errors.

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

**5. Which of the following would be the best choice for use on multi-lane highways?**

1. Traffic safety cones
2. Tubular markers
3. Traffic Safety Drums
4. Vertical flat panel devices

## Barricades

A barricade is an obstruction to deter the passage of persons or vehicles.

Barriers in construction are one of the most important ways to protect workers but also the general public.

The design of barricades for protection of employees must conform to Part VI of the Manual on Uniform Traffic Control Devices are incorporated by reference in 1926.200(g)(2). Barriers should be designed such that they are easily visible and distinguishable as a safety device.

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

1. **Type 1 Barricade** – Used on lower speed roads and streets to mark a specific hazard or can be used for sidewalk closures as appropriate. The Type I Barricade usually has only one reflective rail. Typically, it is at least 24 inches wide with orange and white stripes alternating at a 45-degree angle.
2. **Type 2 Barricade** – Used on higher speed roadways and has more reflective area for nighttime use to mark a specific hazard. Type II Barricades have two reflective rails, also with alternating orange and white stripes.
3. **Type 3 Barricade** – Used for road closures. Type III Barricades are larger and have (use guessed it) three reflective panels with alternating orange and white stripes. They are at least 4 feet wide (or larger).

**6. Which type of barricade would be best for road closures?**

1. Type 1
2. Type 2
3. Type 3
4. Type 4

## Endnotes

1. Centers for Disease Control and Prevention. (2014). Highway Work Zone Safety. Retrieved from: <http://www.cdc.gov/niosh/topics/highwayworkzones/>
2. Centers for Disease Control and Prevention. (2014a). Highway Work Zone Safety: Construction Equipment Visibility. Retrieved from: <http://www.cdc.gov/niosh/topics/highwayworkzones/bad/default.html>
3. Occupational Safety and Health Administration. (2014) Preventing Backovers. Retrieved from: <https://www.osha.gov/doc/topics/backover/regulation.html>
4. State of Washington. (2009) Road Construction Work Zone Safety (PowerPoint slides). Retrieved from: <http://wisha-training.lni.wa.gov/training/presentations/WorkZoneSafetyRoadConstruction.pps>