OSHAcademy™
Occupational Safety & Health Training

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

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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Disclaimer

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Contents

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Course Introduction

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This course discusses important ways to protect yourself, your co-workers, pedestrians, and motorists in a road construction zone.

Course Components

Once you complete this course, you will have knowledge in the following items:

- roadway worker risks
- equipment operator risk factors
- temporary traffic control plans
- working at night
- protecting workers in work zones
- blind spot hazards
- backing safety solutions
- spotting hand signals

Module 1: Roadway Worker Risks

Workers in temporary traffic control work zones are exposed to injury from construction vehicles and motorized equipment. Here are some risk factors:

- operating in and around the active work zone(s)
- operating in traffic control or secondary areas that support the work zone
- entering and leaving the work zone

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

- drunk drivers
- sleepy or impaired drivers
- impatient, reckless drivers
- drivers using cell phones or other inattentive drivers
- law enforcement and emergency vehicles
- disabled vehicles pulling in and parking
- lost drivers looking for directions

Drivers Using Cell Phones in Construction Zones

The new survey of law enforcement officers found about 40 percent of drivers operating their vehicles in a construction zone were using a cell phone, resulting in more traffic accidents. In fact, 78 percent of responding law enforcement officials in Northern Virginia alone indicated the number of automobile crashes/incidents in construction zones has increased since they joined the department.

For responding police officers, the cause behind the increase in incidents is clear. They say cell phone use is overall the primary causes of crashes in at least 34% of accidents in road construction zones.

Real Life Accident

An inattentive driver rear-ended this attenuator truck at 63 mph, despite workers' attempts to get the driver's attention. Two workers were hurt and the driver received minor injuries.

The driver pled guilty to reckless endangerment of a roadway worker.

Workers on Foot Risk Factors

Flaggers 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 motorists or 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.

According to the Bureau of Labor and Statistics (BLS), 844 worker deaths occurred in roadway work zones from 1995-2002 in the United States.

Here are some other sobering statistics involving work zone accidents:

- 91% of the 844 deaths were related to motor vehicle traffic, construction equipment, or both.
- From 1992-1997, there were 90 deaths/year on average in the United States.
- From 1997-2003, there were 120 deaths/year on average in the United States.

BLS says construction vehicle-related accidents are responsible for the increase in worker deaths.

Traffic Control Around Work Zones

Flaggers and other workers assigned to traffic control responsibilities work very close to motor vehicles. This increases their risk of getting hit or run over by passing vehicles. Therefore, flaggers must be trained in traffic control techniques.

Temporary Traffic Control Plans

A traffic control plan helps move motorist traffic safety 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.

In the Temporary Traffic Control zone, construction vehicles and equipment moving inside create a risk to workers on foot requiring additional protection planning and policies to minimize backing-up maneuvers in the “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, and the buffer space.

The “work space” is the portion of the road closed and set aside for equipment, workers, and materials. Work spaces are usually separated from the traffic space with channeling devices or temporary barriers and signs. This protects both vehicles and pedestrians.

Here are some other important components of a temporary traffic control plan:

- Restrict personnel access points into work areas and define/designate “no backing zones” and “pedestrian-free zones.”
- 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.
- Establish procedures for entering and exiting the work zone.
- Train all employees on the Temporary Traffic Control Plan and its precautionary measures.

Working at Night

Visibility is greatly reduced at night and your risk of getting injured or even killed increases in the dark. Drivers may be more tired, sleepy, and less attentive.

Hazards and Problems at Night

- poor visibility
- glare off lights
- adverse weather conditions
- tired drivers
- inattentive workers

Protect yourself when you must work at night by doing the following:

- Be aware of your surroundings at all times.
- Wear high visibility apparel.
- Arrange good work area lighting.
- Set up proper traffic controls.
- Know the traffic flow plan and pattern.

Protecting Workers in Work Zones

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

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

- comprehensive site-specific safety program
- temporary traffic control plan in place for the project site

Workers must do the following in a work zone:

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

- If you do not have a reason for being there, do not linger or cross into areas around moving equipment.
- Use extra precautions and additional safety apparel at night and during poor weather conditions.

Protective Measures

Pedestrian Workers

- Keep operators who are working near moving equipment in eye contact.
- Remember equipment blind spots and limited visual areas.

Equipment/Vehicle Operators

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

Module #1 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

1. What percentage of drivers are using their cell phones in a construction zone?

a. 40
b. 20
c. 15
d. 35

2. ____ worker deaths occurred in roadway work zones from 1995-2002.

a. 750
b. 844
c. 625
d. 310

3. What is the purpose of a traffic control plan at a road construction site?

a. Helps motorists drive safely around work zones
b. Protects the public and workers
c. Keeps traffic moving at a quick pace
d. Both A and B are correct

4. The _____ is the portion of the road closed and set aside for equipment, workers, and materials.

a. construction zone
b. work space
c. driver space
d. equipment space

5. Which of the following are ways to protect yourself while working at night?

a. Be aware of your surroundings
b. Wear dark clothing
c. Use a flashlight
d. Avoid working at night

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.

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.

Blind Spot Hazards:

- running over or striking pedestrians
- smashing site materials and tools
- striking other equipment or vehicles
- rollover on steep slopes
- contact with utilities

Obstructions in a driver's line of sight might be one of the following:

- mirrors
- cab arrangements
- door and window post
- stacks and air cleaners
- bug shield or other ornamentations

- box, tank, and other equipment configurations

Tools and attachments on vehicles can also create greater 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.

Here are a few ways to protect yourself when working near heavy equipment:

- Do not cross directly in front of or immediately behind large heavy equipment or trucks where the operator sits higher in the vehicle.

- Communicate with the operator (either verbally or by eye contact) before entering any area near heavy equipment or large trucks.

- 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.

Operating Dump Trucks in Reverse

According to BLS, between 1995 and 2002, dump trucks were responsible for 41% of "worker on foot" related deaths. 52% of these involved dump trucks backing up.

If employees are in the backing zone or it is reasonable to expect employees will enter the backing zone behind a dump truck, 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

In October 2006, a 28-year-old 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.

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:

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

Suggested Spotting Signals

Below are some common spotting signals:

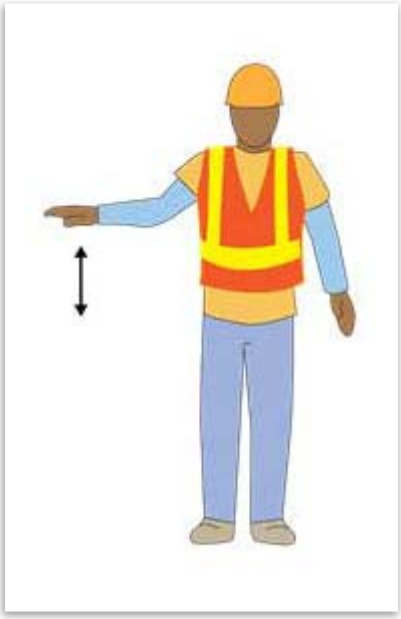
Back up

Back, turn left

Back, turn right

Move forward

Distance left to back



Slow down

Stop

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

Radar and ultrasonic technology both are used in backing safety systems. A radar system transmits a signal, which is bounced off an object. The signal is then received by a receiver. 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. Also, the composition of an object can affect detection, with some materials being virtually invisible to radar. Like cameras, this equipment can be mounted on most vehicles and may be an option from some equipment manufacturers.

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.

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. 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. 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.

Internal Traffic Control Plans

An internal traffic control plan (ITCP) is another method used to address backover hazards. These are plans that project managers can use to coordinate the flow of moving equipment, workers, and vehicles at a worksite to minimize or eliminate vehicles and employees from crossing paths. These plans can significantly reduce, or possibly eliminate, the need for vehicles to back up on a site.

Module #2 Quiz

Use this quiz to self-check your understanding of the module content. You can also go online and take this quiz within the module. The online quiz provides the correct answer once submitted.

1. The _____ the equipment, the _____ the blind spots or hazardous areas for pedestrians and ground workers.

a. bigger, larger
b. heavier, bigger
c. smaller, larger
d. smaller, smaller

2. If you have to stand near parked equipment or trucks, where should you stand to avoid collisions?

a. In back or on passenger side
b. In front or on operator side
c. Only directly in front of the windshield
d. On the passenger side

3. Between 1995 and 2002, dump trucks were responsible for _____ of worker-on-foot deaths in road construction.

a. 30%
b. 55%
c. 41%
d. 25%

4. What type of system transmits a signal to alert the driver of a possible object in the blind spot?

a. Radar system
b. Alarm system
c. Lighted system
d. Tag-based system

5. Which type of system consists of electromagnetic field generators to alert the driver of a possible object in the blind spot?

a. Radar system
b. Lighted system
c. Tag-based systems
d. Alarm system

Endnotes

1. Centers for Disease Control and Prevention. (2014). Highway Work Zone Safety. Retrieved from: http://www.cdc.gov/niosh/topics/highwayworkzones/

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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