

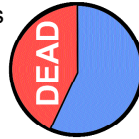
# Avoiding Collisions ( Runovers & Backovers )

## Safety & Health Checklist for the Roadway Construction Industry

### How are most roadway construction workers killed?

Over 40% — nearly half — of the fatalities for roadway construction workers occur when workers are run over or struck by moving vehicles, trucks or equipment.

Over half of the fatalities are caused by construction vehicles and equipment in the work area.



### How can you avoid a "collision" in your work area?

- Be seen.** Make sure you wear high visibility clothing, including a vest and hard hat.



- Communicate.** If you are working near construction vehicles and equipment, make sure the operator/ driver knows where you are located. DO NOT assume he/she can see you.

- Stay back.** Do not approach moving equipment. Communicate with the driver using a radio, hand signals, etc. Only approach the vehicle once the operator has stopped operations.

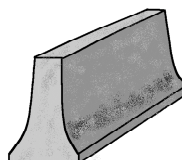


- Plan.** Set up a plan or procedure — some call it an "internal traffic control plan" — to separate workers from the paths of vehicles and equipment. Make sure vehicles know where workers are located and workers know where equipment is operating.

- Look out for other workers.** Use a whistle, air-horn, or other device to warn fellow workers when they are in danger.



- Positive Separation.** Separate workers from traffic using "positive separation," such as barriers, road closures, shadow vehicles, and



buffer space. Remember, this separation is important for BOTH roadway traffic and construction vehicles.

- Be alert.** Don't become complacent with your work environment. Stay alert at all times and in all places. Stop, look, and listen for possible hazards.

#### Flaggers and directing traffic

Each year about 20 flaggers are killed and many more are injured. Flaggers must be especially vigilant to protect against collisions.



- Get trained.** Don't accept an assignment to be a flagger unless you have been properly trained. You must know where to stand, how to dress, and how to properly communicate with motorists.
- Wear high visibility clothing.** Know what type of clothing you should wear depending on the speed of traffic, the time of day, and the complexity of your surroundings.

- Stay focused.** Keep your eyes on oncoming traffic. Make sure your signals are clear and do not conflict with other traffic control signals.



- Plan an escape.** Plan a route so you can move quickly to safety if a motorist does not appear to heed your signals.
- Warn fellow workers.** Make sure you have a way to quickly warn other workers when vehicles do not respond to your signals.

- Respect motorists.** Be courteous. Do not respond to abusive drivers. Notify law enforcement if necessary.



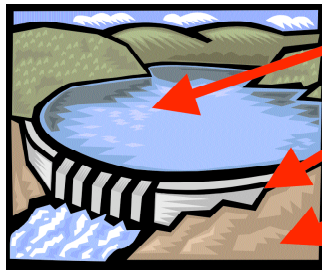
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# Electrical Hazards

## Safety & Health Checklist for the Roadway Construction Industry

### What are volts, ohms, amps, and current?

- ❑ **Voltage** = force or pressure that causes electricity to flow through a conductor (wire). (Think of water held behind a dam.)
- ❑ **Ohm = resistance** that impedes the flow of electricity through a conductor. (Think of pipes. Pipe size restricts water flow.)
- ❑ **Amp** = measurement of **current** — the flow of electrons — from the source of voltage through a conductor. (Think of water moving through a pipe.)



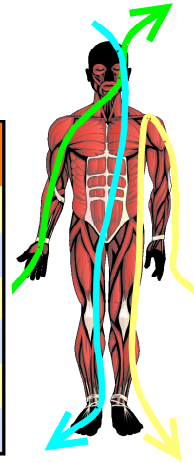
Voltage is like water in a reservoir. It's the measurement of electrical pressure.

Ohm is like water in a pipe. It's the measurement of electrical resistance.

Amp is like water moving through a pipe. It's the measurement of electrical movement or "current."

### How much electricity will hurt me and how?

For death to occur, the body must become part of an electrical circuit. The actual amount of damage depends on the amount of current (amps), the pathway of electricity as it passes through the body, and the duration of the event.



Estimated Effects of AC Currents (U.S. Standard 60 Hz)	
1 milliamp (mA)	Barely perceptible
16 mA	Maximum current an average man can grasp and "let go"
20-30 mA	Paralysis of respiratory muscles
100 mA	Ventricular fibrillation threshold
2 Amps	Cardiac standstill and internal organ damage
15/20/30 Amps	Common U.S. household breakers

**Check for these common sources of electrical energy exposure:**

- Worn power cords (extension cords, hand tools)
- Water on or near electrical outlets, tools & cords
- Temporary circuit boxes and breakers for construction job sites
- Switches and connections on equipment, vehicles and machinery
- Buried utilities
- Overhead power lines

**What are some precautions you can take to avoid contact with electrical energy:**

- Contact appropriate "one call" number.
- Ensure buried utilities are marked by the proper authority.
- Locate and mark overhead power sources. Develop protocols for working near overhead power lines.
- De-energize, lockout and tagout power sources for equipment, tools and machinery before repairing or servicing.
- Use "ground fault circuit interrupters" (GFCIs) on all power tools and equipment that are not double-insulated.
- Inspect tools, cords, etc. to ensure they are in good condition before each use.
- Use appropriate personal protective equipment (PPE) including:
  - o Insulated gloves and footwear
  - o Non-metallic ladders

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# Mechanized Equipment

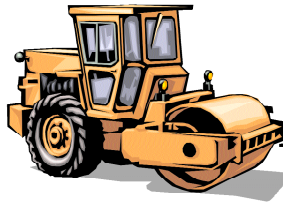
## Safety & Health Checklist for the Roadway Construction Industry

### What hazards are created by construction vehicles and equipment?

Construction vehicles and motorized equipment present a major hazard to highway construction workers. Recent studies indicate that workers are killed just as often by vehicles and equipment operating within the work zone as by motorists that cross the barricades and strike workers.

### Construction vehicles and equipment can endanger:

- Drivers and operators
- Workers on foot
- Motorists/ public



### To avoid roll-over hazards, DO NOT:

- Operate equipment too fast or on a steep grade
- Exceed the manufacturer's load or operating limits
- Use inadequate methods to load machinery onto a transport trailer
- Set, park or operate equipment on soft spots/soft shoulders
- Fail to use seatbelts, if equipped, to remain in position to control the vehicle



### To avoid striking pedestrian workers with the vehicle, or its equipment — such as a bucket or shovel — check to ensure it has:

- Adequate brakes
- Functioning backup alarm
- Known blind spots (operators must check around their vehicle for workers before engaging)
- Proper barricades protecting the swing area of the equipment
- Continuous communication with pedestrian workers



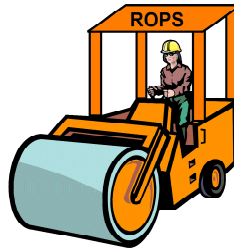
**Common hazards for equipment operators include striking utilities. Operators must have proper training and ensure adequate clearance.** Construction vehicles and equipment can endanger workers by:

- Knocking down overhead wires or tree branches
- Making contact with power lines or buried utilities, causing the equipment to become energized
- Operating with an unguarded/ unbarricaded blade, swing radius and/or scissor points.



**How can operators reduce hazards to themselves?**

- Install and use rollover protective structures (ROPS)
- Install and use seat belts that meet the Society of Automotive Engineers (SAE) requirements
- Maintain a safe speed
- Use spotters for backing, loading, etc.
- Use ramps that are the right size and stable
- Use painted guidelines or other markings to guide operators and indicate hazardous areas



**How can you prevent injuries to workers on foot?**

- Inspect brakes and other stopping devices to ensure they are operating properly and able to stop and hold equipment when fully loaded
- Check to ensure backup alarms work and are louder than surrounding noise
- Use mirrors, closed circuit television, sensors and alarms or spotters to look for workers and hazards
- Make certain cab glass is not dirty, cracked or broken, and does not distort the operator's view
- Have operators check for other workers before starting the machine
- Warn workers when vehicles or equipment with rotating cabs are in use
- Guard scissor points, pinch points, and the swing radius of equipment when necessary

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# High Visibility Clothing

## Safety & Health Checklist for the Roadway Construction Industry

**What is "high visibility" clothing and when do you need it?**

*High visibility clothing* refers to reflective and fluorescent vests, shirts, pants, hats, etc. that workers should wear to make them more visible when working near traffic and heavy equipment, in all light conditions, day and night.



**You should wear high visibility clothing if:**

- You work near traffic (on the side of a roadway, as a flagger, directing traffic, etc.).
- You work near moving construction vehicles and equipment such as large vehicles, dump trucks, pavers, graders, etc.

**What type of clothing should you wear?**

There are different classes of clothing, depending upon the hazards you are likely to face.

- Class 1 garments:** For workers that are separated from vehicular traffic that does not exceed 25 mph; where background settings and worker tasks are not complex.



- Class 2 garments:** Necessary for greater visibility during inclement weather; where work background is more complex and is close to moving traffic and vehicles; workers' attention will likely be diverted from traffic traveling at speeds from 25-50 mph.



- ❑ **Class 3 garments:** Traffic speed is greater than 50 mph; worker must be conspicuous — and identifiable as a person — through the full range of body motions at a minimum of 1,280 feet.



**Is high visibility clothing hot and uncomfortable?**

When the ANSI/ISEA 107 Standard for High Visibility Apparel was first developed, some of the early designs were hotter than what road-way construction workers were used to wearing.

Over the past few years, new designs have been developed, made of light-weight, breathable fabrics that are much cooler and can be comfortably used in hot and humid weather.

To obtain more information about the ANSI/ISEA 107 standard or to order a copy of High Visibility Apparel, contact the International Safety Equipment Association (ISEA) at [www.safetysafetyequipment.org](http://www.safetysafetyequipment.org).

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# Multi-Employer Policy

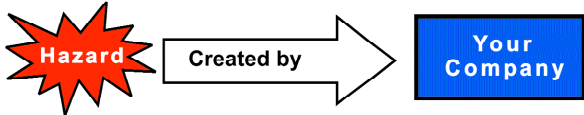
## Safety & Health Checklist for the Roadway Construction Industry

**Are you covered by OSHA's Multi-Employer Policy?**

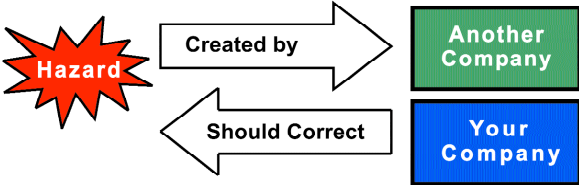
You may be responsible for activities of other employers on the job site that expose workers to safety and health hazards.

Is there more than one employer / contractor on your site? If yes, then continue.

[ ] Did your company create and expose your workers OR the workers of another employer to hazards?

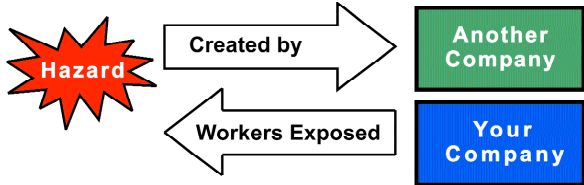


[ ] Is your company responsible, by contract or actual practice, for the safety and health conditions on a work site (even if none of your workers are exposed or your company did not create the hazard)?



[ ] Does your company have the responsibility for actually correcting the hazard (even if none of your workers are exposed or your company did not create the hazard)?

[ ] Are your workers exposed to a hazard that was created by another employer?



If you checked any of the boxes on the front, YOU MAY BE SUBJECT TO A CITATION FROM OSHA THROUGH THE MULTI-EMPLOYER POLICY.

Before OSHA issues a citation, it will consider the following issues that may reduce an employer's liability:

Did your company create the hazard?

Did your company have the responsibility or authority to correct the hazard?

Did your company have the ability to correct or remove the hazard?

Did your company notify the other responsible employers about the hazard to which their employees were exposed?

Did your company instruct its employees to recognize the hazard and 1) take steps to remove its employees from exposure, or 2) in extreme cases, remove its employees from the job?

**What do you do when you find a hazard on your job site?**

Correct or remove the hazard. If you are unable to do so, then:

Notify your workers and other employers of the hazard, and

Remove your workers from exposure to the hazard, or

Remove your workers from the job site.

**NO MATTER WHAT OTHER EMPLOYERS OR WORKERS MAY DO, YOU ARE ULTIMATELY RESPONSIBLE FOR THE SAFETY AND HEALTH OF YOUR WORKERS.**

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# Night Work

## Safety & Health Checklist for the Roadway Construction Industry

### What are some of the common problems identified with night work zones?

- Reduced visibility
- Driver impairment or inattention (drugs, alcohol)
- Fatigue, sleepy drivers
- Inadequate lighting
- Poor maintenance of traffic control devices



### What are some of the solutions to the problems of night work?

- Have police officers present and visible
- Make workers more visible (better garments and lighting)
- Use drums in the taper
- Keep traffic control devices in good condition
- Provide adequate lighting
- Space traffic control devices closer together to reduce confusion — especially on ramps, crossovers, etc.



### What can be done to reduce hazards for drivers?

- Use changeable message signs with up-to-date information.
- Obtain assistance from law enforcement. Ensure that all signs, markings, channelizing devices, and barricades are in good condition.
- Remove devices that are dirty, disfigured, or are not retroreflective.
- Use good quality temporary pavement markings. Cover or remove old, confusing markings.
- Increase the length of tapers to facilitate merges.
- Use transitional lighting to avoid temporary blindness from abrupt transitions from darkness to bright light and from bright light to darkness.
- Ensure that temporary work lighting does not glare in the eyes or mirrors of passing motorists.
- Move signage along with the work zone.



### Does night work increase health problems?

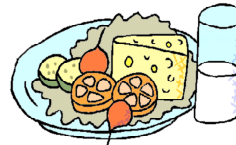
Working at night makes it difficult to get enough sleep. Sleep after night work usually is shorter and less refreshing or satisfying than sleep during the normal nighttime hours.



Some research suggests that night workers have more upset stomachs, constipation, and stomach ulcers than day workers.

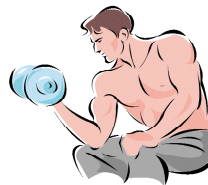
### How can you protect your health and safety when working at night?

- Avoid permanent (fixed or non-rotating) night shifts.
- Keep consecutive night shifts to a minimum.
- Avoid quick shift changes.
- Plan some free weekends.
- Avoid several days of work followed by four to seven day "mini-vacations."
- Keep long work shifts and overtime to a minimum.
- Consider different lengths for shifts.
- Examine start-end times.
- Keep the schedule regular and predictable.
- Consider taking more frequent rest breaks.



### How can you maintain an active family and social life?

- Schedule activities on weekends or "off-days" to be with family and friends.
- Plan one meal a day when the family can eat together.
- Schedule "quiet" time during the day when you can get adequate, uninterrupted sleep.
- Don't participate in too many activities or other work that prevents you from getting adequate rest.
- Maintain a healthy diet and find time to exercise.



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# Personal Protective Equipment

## Safety & Health Checklist for the Roadway Construction Industry

### What is Personal Protective Equipment?

Hard hats, safety glasses, face shields, earplugs, fall arrest systems, safety-toed shoes, and respirators are all types of *personal protective equipment* or PPE.

In the roadway construction industry, there are many potential hazards you might face every day. Your use of PPE is very important to protect your safety, health, and even life.



### Who should provide your PPE?

It is the employer's duty to make sure you have the necessary equipment to safely do your work. In some cases, if the PPE could likely be used away from work, you may be required to purchase your own. The items you may have to purchase are apparel such as safety-toed shoes, prescription safety glasses and outerwear.

### What types of PPE should you use?

The best way to protect against hazards is to eliminate them, such as providing guardrails to prevent falls, or good ventilation to remove fumes and gases.

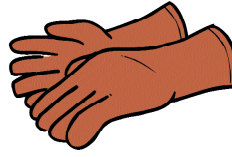
In roadway construction, these "engineered" hazard controls are not always feasible, so PPE must be worn to protect against the hazards to which you are exposed on any given task.

### Here are some of the basics:

- Hard Hats** (head protection): Protect against electrical shock and impacts caused by falling objects or rocks thrown by passing vehicles. May provide for increased visibility near traffic and large vehicles.
- Safety Glasses** (eye and face protection): Protect against chemicals, particles, dust, and other airborne substances. Some safety glasses protect against the bright sun and provide UV protection for the eyes.



- ❑ **Gloves** (hand & arm protection): Protect against burns caused by electrical hazards, hot materials (asphalt), caustic materials (wet cement), and provide protection against cuts, punctures, blisters and skin irritation.

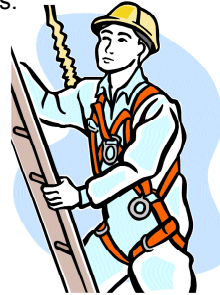


- ❑ **Ear plugs/muffs** (hearing protection): Protect against hearing loss that may occur suddenly, or gradually over time due to exposures to loud noises, such as heavy equipment or noisy hand tools.



- ❑ **Safety-toed shoes** (foot and leg protection): Provide protection against sharp, falling or rolling objects, hot materials, and slippery surfaces.

- ❑ **Harnesses and lanyards** (fall protection): Protect workers from falling. Required for exposures at six feet or higher, such as bridge construction, form work, overpasses, etc.



- ❑ **Respiratory protection** (dust mask / respirator): This type of protection can be a bit complicated, and will require competent personnel to determine what type of protection is needed and proper fit. You may need protection if you are working with or in proximity to:

- o dust containing silica (concrete & asphalt cutting, rock crushing, sand blasting)
- o metal fumes (from welding, brazing, soldering)
- o chemical fumes (motor fuels, cleaners, petroleum-based products)



To obtain more information about personal protective equipment, contact the International Safety Equipment Association (ISEA) at [www.safetysite.org](http://www.safetysite.org).

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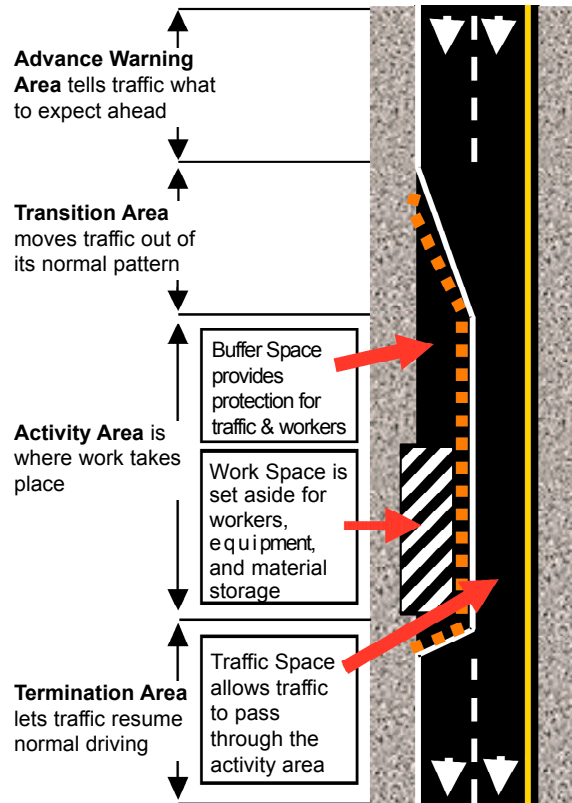
# Temporary Traffic Control Zones

## Safety & Health Checklist for the Roadway Construction Industry

### What is a "Temporary Traffic Control Zone" or "Work Zone"?

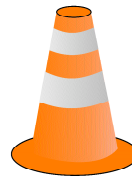
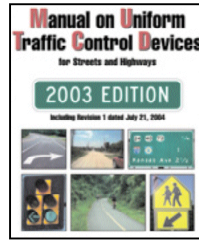
A temporary traffic control zone, commonly known as a work zone, is the area on a roadway where construction work is taking place adjacent to traffic. Because of the constraints and locations of most work zones, they can pose many hazards for workers and motorists.

For definition purposes, a work zone has the following parts: 1) Advance Warning Area, 2) Transition Area, 3) Activity Area (Work Space, Traffic Space and Buffer Space), and 4) Termination Area.



Review the following items to help you determine if your work zone is set up properly:

- Is the work zone set up as designed in the Traffic Control Plan? OR, if it is a small job where a traffic control plan was not developed . . .
- Are the traffic control devices (signs, markings, cones, barrels, etc.) set up as specified in the *Manual on Uniform Traffic Control Devices*?
- Are your signs in good condition? Do they maintain their "retroreflective" properties?
- Are your advance warning signs placed at the proper distances to adequately warn drivers?
- Are your channelizing devices (cones, barrels, barriers, etc.) placed properly, spaced at the proper distance according to traffic speeds?
- Are your channelizing devices in good condition? Do they maintain their "retroreflective" properties?
- Have old pavement markings been completely removed, and are new, clear temporary markings in place?
- Does your work zone traffic control require a flagger?
- Has your flagger been trained in a recognized program?
- Is your flagger attentive, always facing oncoming traffic, standing in the proper location, and using the correct signals/ paddle to direct traffic?
- Is your flagger properly dressed, with appropriate clothes to make him or her visible to traffic and construction vehicle operators?
- Does your flagger have a way to communicate with the other workers on the site?



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