

# Highway Work Zone Safety

## An Introduction

HS 02-043B (1-06)

Highway construction and repair work zones are always hazardous environments. Inside a work zone is a dangerous combination of pedestrian workers and large trucks, bulldozers, rollers, and other moving machinery. These machines are often called upon to work on steep inclines and near trenches or berms that can cause them to roll or tip over. Passing close by these work zones is a daily stream of traffic. Speeding, inattentive, or intoxicated drivers may ignore all warning devices and penetrate the work zone. Backing construction trucks frequently caused fatal accidents involving pedestrian workers caught in the truck's blind spot. Rollover fatalities occurred to truck drivers and equipment operators. Other fatal accidents are caused by equipment contacting overhead power lines or striking buried gas lines, workers falling from machinery and structures, and falling objects or construction materials. All of these dangers are made more severe when the factors of bad weather, dust, or darkness are added to the list.

## Varying Solutions

Multiple methods must be used to tackle so many types of dangers. We will look at the traffic control problems first. The National Institute for Occupational Safety and Health (NIOSH) makes specific recommendations for each of the professions involved in the planning and work phases of any highway project.

Engineers must conduct surveys of the area and design each work zone in advance of laying it out and beginning work. One essential of the survey is noting the locations of high voltage lines and the clearance beneath each one. The engineers must also contact 'dig-safe' sources such as telephone and water companies as well as natural gas suppliers to establish the presence of buried equipment and hazards. It is required that all zones be constructed in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) that was developed by the Federal Highway Administration. The MUTCD contains extensive specifications for designing and correctly marking traffic control areas. It also addresses worker training, personal protective equipment, and lighting. The Occupational Safety and Health Administration (OSHA) also has standards that must be followed such as 29 Code of Federal Regulations 1926, Subpart G that covers signs, signals, and barricades used in the work zone. If excavations are part of the project, Subpart P must be followed. It will be the responsibility of the project manager to ensure that these standards are adhered to. Whenever feasible, close the road



completely and reroute traffic. If a traffic control zone must be set up, an experienced Traffic Control Plan (TCP) supervisor should be appointed to begin work with the engineers during the planning phase. It will be the TCP supervisor's duty to monitor the zone throughout the duration of the project and make any corrections that may be needed. Keep the length of the control zone appropriate to the size of the work zone so that drivers don't speed up after passing through a long stretch with no workers in sight. Traffic control zones are laid out in four sections. First comes the **advance warning** section. In this area, motorists are advised they are approaching a work zone by warning signs, rumble strips, and radar transmitters. If an alternate detour route is available so motorists can choose to avoid the work zone entirely, place advisory and directional instruction signs prior to its exit. Signage is designed and must be placed to give drivers clear information and instruction about what they must do to safely pass through the rest of the zone. Sign messages must be clear, short, and spaced correctly so that the needed information is understood in time for the driver to safely perform the necessary maneuvers. Spacing will be based on the speed limit where drivers first encounter the signs. If warning lighting is in use, make sure that the light levels are adjusted in a timely manner. Bright daytime lighting can dazzle drivers during hours of darkness. Dimmer night light levels will not be readily visible in daylight hours. It has been found that the most effective warning device is an occupied, marked police vehicle with its warning lights flashing. These should be used whenever possible for zones on highways with high speed limits where the traffic control zones allow relatively high speeds. They should also be employed in urban areas where there will be extra heavy traffic and where work areas have to be very close to the traffic control lanes.

Next, traffic enters the **transition** section where channeling devices such as cones and barricades will direct it into the safe lanes. The transition zone must be laid out so that motorists don't have to make abrupt changes of speed or direction. The third area is the **activity** section, adjacent to the actual work zone. An adequate buffer zone between the traffic control zone and the work zone has to be constructed as part of the plan. A buffer zone needs to be of sufficient depth, with strong barriers placed between traffic and workers. Deflecting barriers should be placed where traffic will be running closely parallel to the work zone.

## Use of Flaggers

---

During some work situations, the TCP supervisor may have to place flaggers at the beginning of, or in the activity zone. Alternatives to flaggers should always be used when hazardous conditions such as limited visibility or high-speed traffic are present. If flaggers must be used, they must be adequately trained before assuming their duties. Flaggers must be placed where approaching drivers can easily see them and never placed in shadows or where other workers may be close to them. Their station must have an escape route. Flaggers must be trained to gain and maintain eye contact with motorists and to be courteous but firm when communicating with drivers by both word and gesture. They must be dressed in bright warning vests. In conditions other than snow or fog they should wear white outer garments and hardhats. They should be equipped with Stop/Slow paddles having built-in strobe warning lights. Even when the flaggers are in visual contact with each other, they should also have radios for back up to visual communication and to report emergency situations. Flaggers need to be trained in advance on the correct actions to take if emergency vehicles enter the traffic control zone. If the flaggers are relying solely on radio communication, they must be equipped with spare batteries or back-up radios. In situations where very long single-lane traffic is required, a pair of specially marked pilot cars can be organized to lead groups of traffic back and forth through the activity zone. The final section of the traffic control zone is the **termination** area where channeling devices and signage return traffic to normal speed and lane configuration.

## Testing Zone Effectiveness

---

Once the traffic control zone is in use, the TCP supervisor will verify its effectiveness by walking or riding the zone periodically, looking for evidence of near misses. Examples of evidence could be damaged signage and barriers or skid marks. How often this should be done is contingent on the volume of traffic traversing the zone and prevailing weather conditions. If reflective signs are found to be dirty, make sure they are cleaned to preserve their reflective intensity. Encourage all employees to quickly report any problems they may witness in the traffic control zone.

In addition to the traffic control plan for outside of the work zone, an Internal Traffic Control Plan (ITCP) must be created for the work zone itself. Both plans should coordinate with each other. An ITCP supervisor will control traffic within the work zone. Depending on the size of the project, this may, or may not be the same individual who supervises road traffic control. He or she will work closely with the project manager and construction supervisor to make the plan effective. The plan must be capable of modification as the work progresses and conditions in the work area change. Here are some possible

details of an ITCP. Areas may be designated where only pedestrians are allowed and there may be vehicle-only areas as well. Try as much as possible to schedule work activities so that pedestrians and vehicles are not present in the same area at the same time. By necessity, there will be areas where pedestrians and machines will have to be working at the same time. Safe speed limits must be posted and enforced in all vehicle areas within the zone. Examples of other in-zone signs include the clearance below high voltage lines, blind corners, and warnings of drop-offs hazardous to machine operators. Safety training of all workers in advance of their entry into the work zone is mandatory. They must be trained to remain aware of their surroundings at all times and in all types of weather conditions that may prevail day and night. In those areas of mixed pedestrian and machinery traffic, pedestrians and operators must train together on communications. Pedestrians must never closely approach vehicles without making eye contact with the operator.

An operations communication plan must be part of the ITCP. Establish a set of hand signals that are to be used by all employees and test the employees for 100 percent comprehension. Spotters and machine operators must be trained to maintain visual contact during operations. Operators should instruct new spotters on any blind spots around their machinery and review these with any spotters who have previously worked with them but may have been re-assigned or absent for a period of time. Blind spots can also be equipped with proximity sensors or cameras to warn the operator of pedestrians and smaller vehicles. Such systems have to be tested prior to the beginning of each shift. Spotters and operators can also communicate via radio for extra safety. As final protection for pedestrians, machinery should have panic stop bars installed in appropriate locations that allow the pedestrians to turn off the machine's motor in a threatening situation. Smaller vehicles like pickup trucks should be marked with red flags or tall antennas to enhance visibility from bigger machinery. Large machinery can be marked with strobe lights for additional warning. Roll over protection for the equipment operators should be in place at all times. Quick communication must be available between all motorized equipment operators. The ITCP supervisor must be easily recognizable and accessible to all sub-contractors on site.

Additional personal protective equipment may be needed in different operations. Fall protection must be provided any time workers are working more than six feet above a lower level. Respiratory protection against silicosis must be provided in areas where concrete cutting or mixing is taking place. A program of daily inspections of each piece of machinery with checklists should be set up prior to starting operations. When maintenance must be performed in a work zone, proper lockout / tag out procedures must be followed. When placing lighting for night work, make sure that it will not blind operators or workers in the zone.

## Summary

---

You can take all of these measures into account when designing and operating traffic control and work zones. Tailor your plans to fit the necessities of the job at hand and you will have a safe and efficient work site. As work proceeds, document the changes in the work zone and retain the records as a reference for future jobs.

## Quiz

---

- Place these areas of a traffic control zone in order of traffic flow.
  - Activity
  - Termination
  - Advance warning
  - Transition
- Pedestrian worker fatalities often occur in a backing truck's blind spots. True or false?
- Standards for setting up traffic control and work zones and safety standards for construction work are found in:
  - The Federal Highway Administration's "Manual of Uniform Traffic Control Devices"
  - Code of Federal Regulations 1926, Subpart G
  - CFR 1926, Subpart P
  - All of the above
- Flaggers should be equipped with:
  - A high visibility vest and a 'Stop/Slow' paddle with strobe light
  - A recliner to sit in and a book to read when they get bored
  - A highly visible station with an escape route
  - Answers a and c
- People working \_\_\_ feet above a lower level must have fall protection.
  - 3
  - 6
  - 9
  - 12

The Texas Department of Insurance,  
Division of Workers' Compensation (TDI/DWC)  
E-mail [resourcecenter@tdi.state.tx.us](mailto:resourcecenter@tdi.state.tx.us)  
or call 1-800-687-7080 for more information.

## Answers

---

- c. Advance warning, d. Transition, a. Activity, b. Termination.
- True
- d. All of the above
- d. Answers a and c
- b. 6

---

## Resources

---

The Texas Department of Insurance/Division of Workers' Compensation (TDI/DWC) Resource Center offers a workers' health and safety video tape library. Call (512) 804-4620 for more information or visit our web site at [www.tdi.state.tx.us](http://www.tdi.state.tx.us).

Disclaimer: Information contained in this training program is considered accurate at time of publication.

*Safety Violations Hotline*  
**1-800-452-9595**  
**[safetyhotline@tdi.state.tx.us](mailto:safetyhotline@tdi.state.tx.us)**