



SUBJECT: Hispanic laborer died after being struck by a vehicle in a roadway work zone.

SUMMARY

A 23-year-old Hispanic utility contracting company worker died on December 30, 2003 from head injuries he received after being struck by a vehicle in a roadway work zone. He and a co-worker were cleaning mud out of a manhole so a telephone utility company could make repairs. A sport utility vehicle crashed through approximately 100-120 feet of 28-inch warning cones and into the rear end of the work crew's trailer, which was connected to their truck. The decedent was standing near the manhole between the front of the gooseneck trailer and the back of the truck. His co-worker was in the manhole, hoisting out buckets of mud. The decedent was impacted by the front of the trailer and then thrown 20 feet along the side of the roadway. He was transported to a local hospital and was pronounced dead in the emergency room.

Oklahoma Fatality Assessment and Control Evaluation (OKFACE) investigators concluded that to prevent similar occurrences, employers should:

- Consider all applicable elements of a traffic control management program in accordance with the degree of risk to personnel in a work zone.
- Consider utilizing traffic control signs and deploying flaggers and/or traffic monitors when high-risk operations must be engaged, particularly for short periods of time when the use of barriers is not practical.
- Use a particularly high-visibility device at the beginning of road channelizing demarcation to increase the visibility of the impending hazard.
- Ensure that a competent person evaluates the site before work begins, and re-evaluates the site during the work process, in order to provide a safe work zone free of hazards to employees and the public.
- Ensure that all employees receive documented training regarding the hazards of work zone activities, such as parked vehicle positioning, positioning of employees, line-of-sight issues, and proper placement of work zone barriers and control devices.
- Develop and implement a formal occupational health and safety management system that is focused on continual improvement.

INTRODUCTION

A 23-year-old Hispanic worker for a utility contracting company died on December 30, 2003 from head injuries he received when a sport utility vehicle crashed into his roadway work zone. OKFACE investigators reviewed the death certificate and reports from the police, the Medical Examiner, and the Occupational Safety and Health Administration (OSHA). A site visit was conducted on February 17, 2004 and OKFACE investigators interviewed company officials at the company offices.

The decedent worked for a utility contracting company that had been in business 12 years and had eight employees at the time of the incident. The company had been contracted to clean out a telephone utility manhole, so that the utility company could make repairs. The decedent and his

supervisor (the foreman) were assigned to clean out mud that was preventing access to a leaking pipe. The deceased worker had been employed by the company for approximately one year prior to the incident.

The company did not have a comprehensive safety and health program in place. Employees only received informal safety training, either given on-the-job or at sporadically conducted safety meetings. The company did have a safety officer, but this person had other duties and was not at the site when the incident occurred. The deceased worker had received relatively little training, except on-the-job training on personal protective equipment and how to dig next to and around utility lines. He knew little about working in or around vehicular traffic or setting traffic cones. Foremen were responsible for worker safety, including traffic control, on the job site; however, they had no formal training either. According to company policy regarding work zone situations, the decision to contact a traffic control company was left to the foreman's discretion. Company officials had instructed their foremen to contact a traffic control company to place signs and devices if necessary, but gave no specific directions on the instances that would require such a decision. Neither the decedent nor the foreman had received training on the OSHA regulations for traffic safety requirements, and no one else inspected the site where they were working. Furthermore, no one at the company was aware of the specific OSHA regulations and standards pertaining to employees exposed to traffic hazards.

INVESTIGATION

On the day of the incident, the weather was clear with a temperature of 40 degrees Fahrenheit. The asphalt roadway and all working surfaces were dry. The work zone was 125

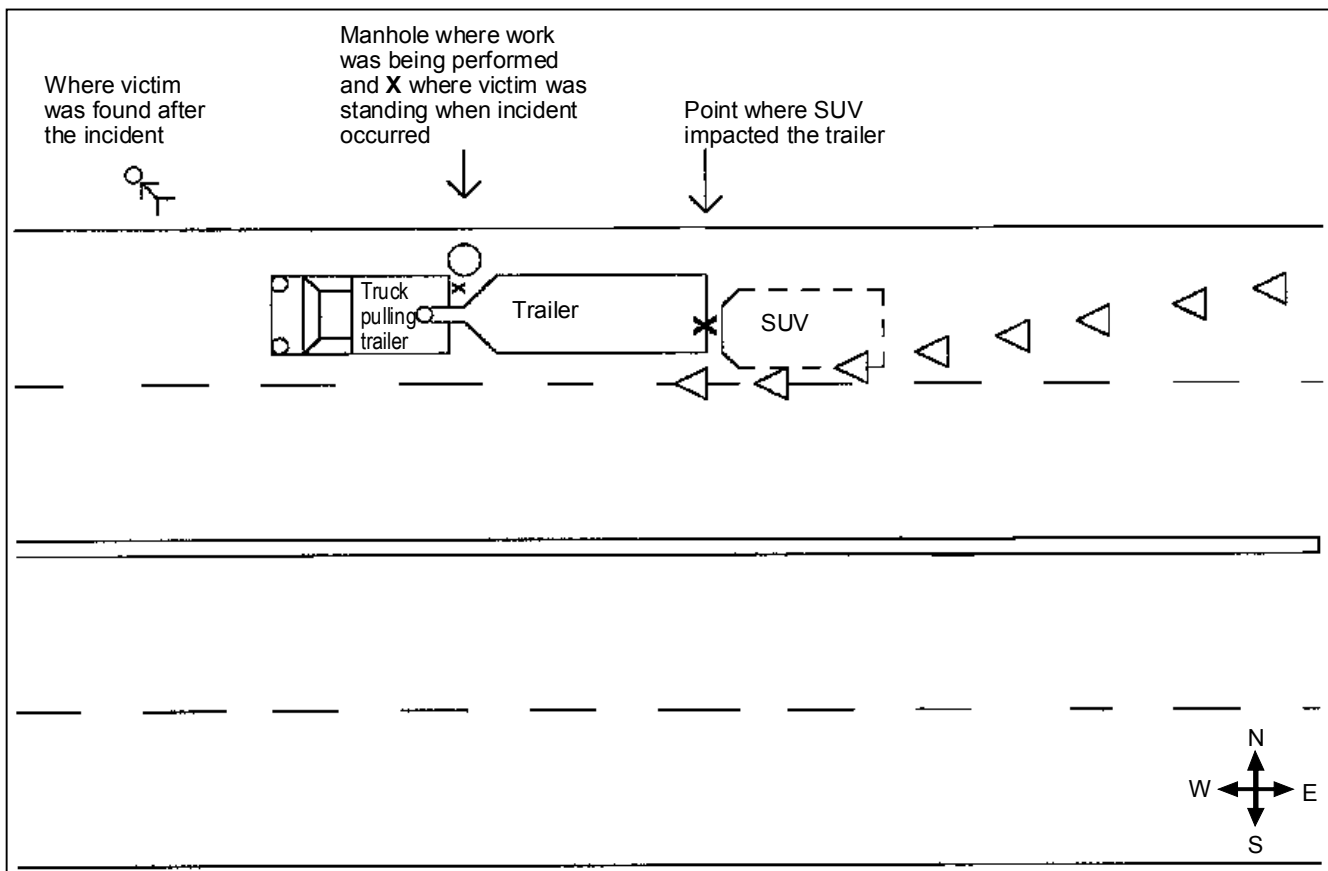


Figure 1. Diagram of Work Zone (not to scale)

located along a flat and straight stretch of road in an urban area, with a line-of-sight of 1-1 ½ miles. The incident occurred around 4:30 p.m. in the outside westbound lane of an undivided four-lane street. The street had a heavy traffic volume and a posted speed limit of 45 miles per hour. The lane was measured to be 10 feet wide, and the crew's truck and trailer was eight feet across the bed at its widest.

The decedent and foreman were assigned to clean mud out of a manhole so that the utility company could make repairs inside of it. When the two workers arrived at the site, the utility company had installed traffic control signs and devices and had used two of their trucks to block traffic for workers entering the manhole. The utility company had also established and ensured the safety of the manhole. Both the foreman and the decedent were wearing orange reflective vests and hard hats. The foreman entered the manhole and began shoveling mud into a five-gallon bucket. The foreman would hoist the bucket to the decedent standing on the street, who would then empty it into a trailer. The decedent and foreman brought a one-ton truck to the site, which pulled a general purpose gooseneck trailer with a 21-foot working length.

The pair worked until the trailer was full of mud and then left the site to empty it. While they were gone, the utility company personnel determined that a sufficient amount of mud had already been removed and that they could proceed with the necessary repairs. When the cleanout crew returned to the site, approximately two hours later at 2:30 p.m., the utility company had finished their work, removed all traffic control measures, and left. The decedent and foreman understood their assignment to mean removal of all the mud in the manhole; therefore, they determined to re-enter the manhole and complete the job.

With all traffic control signs and devices gone, the foreman tapered the two westbound lanes down to one by placing seven or eight 28-inch traffic cones over 100-120 feet (Figure 1). He also parked the truck and trailer with the gooseneck over the manhole opening in an effort to provide some protection from oncoming vehicles. The flashers, which were regular motor vehicle brake and signal lights, were illuminated and properly functioning on the truck and trailer. No traffic signs were placed to warn motorists of the work zone because there were none available on the truck. The foreman re-entered the manhole and the decedent remained on the street to empty the mud-filled buckets. The decedent stood near the manhole, between the truck and trailer. They resumed working for another 1-2 hours before the incident occurred.

A westbound sport utility vehicle, driving into the sun, failed to merge into the inside lane and was witnessed to crash through the traffic cones tapering the lane and into the back of the workers' trailer. The right side of the vehicle impacted the left rear side of the trailer. The decedent, who was still standing by the manhole, was crushed between the truck and trailer before being thrown from the collision. Both the decedent and the trailer were propelled west, 20 feet down the side of the street. The foreman, who was inside the manhole, heard the crash and immediately climbed out. A witness and an off-duty police officer were first on the scene; however, 911 was called immediately and arrived a short time later.

The driver of the vehicle was taken to a local hospital for treatment and was cited for inattentive driving. The decedent was also transported to a local hospital where he was pronounced dead in the emergency room as a result of the injuries he received.



CAUSE OF DEATH

The Medical Examiner listed the cause of death as head trauma.

RECOMMENDATIONS

Recommendation #1: Employers should consider all applicable elements of a traffic control management program in accordance with the degree of risk to personnel in a work zone.

Discussion: Inattentiveness of the public motorist and consequent intrusion of the vehicle into the work zone was an underlying cause of this incident; however, driver behavior is not under complete control of the employer in the work zone. Accordingly, employers must protect work crews by planning for and providing traffic control devices that are appropriate for the conditions of and tasks within the work zone. Proper warning signs, adequate barriers or barricades, and temporary lane closure, all of which are acceptable methods according to the *Manual for Uniform Traffic Control Devices* (MUTCD; <http://mutcd.fhwa.dot.gov/>), could be implemented while a high-risk operation is underway in a work zone. *Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment* is an additional resource document that is available from the National Institute of Occupational Safety and Health (<http://www.cdc.gov/niosh/injury/traumazone.html>).

High-risk operations, for purposes of this discussion, are situations in which workers must be positioned, unprotected by a physical barrier, within six feet of an active traffic lane with a speed limit in excess of 30 miles per hour. At a speed of 45 miles per hour, a driver need only veer 1.7 degrees from the roadway edgeline for a time period of three seconds to collide with an object that is six feet outside of the edgeline. This slim margin for error, combined with the force generated by a heavy vehicle traveling at this speed, defines an extremely critical risk for an exposed worker by every credible risk assessment model. The MUTCD lists the following program elements that should be considered to reduce such a risk to personnel in a work zone: 1) employee training, 2) worker clothing, 3) barriers, 4) speed reduction, 5) use of police, 6) lighting, 7) special devices, 8) public information, and 9) road closure.

The application of each program element should be considered in the bidding of project work and adequately applied by work crews as the project progresses. Safety and crew management personnel should be sufficiently familiar with these elements and the options they provide, and they should be capable of deploying the appropriate protective measures in accordance with the pre-established work plan or otherwise in an abnormal or unusual circumstance.

Recommendation #2: Employers should consider utilizing traffic control signs and deploying flaggers and/or traffic monitors when high-risk operations must be engaged, particularly for short periods of time when the use of barriers is not practical.

Discussion: Driver behavior is perhaps the most critical issue in work zone fatalities. Activities and actions, such as deployment of a flagger in accordance with the MUTCD guidelines and OSHA regulations, that provide sufficient warning and adequately gain the attention of drivers to the imminence of the hazard offers an important opportunity to reduce this risk. The use of a crew member as traffic monitor for individuals whose attention cannot be focused on the



traffic hazard can provide a secondary protection for workers. A monitor can notify exposed workers, giving them the opportunity to leave the high-risk area when a driver is encroaching on the work zone for any reason.

In this situation, additional traffic control signs would have given motorists advanced warning of the work zone ahead. By the time, the vehicle ran through the traffic cones, the decedent had no time to evacuate the area. Even though the driver was not paying full attention, additional measures to capture attention or gain notice of the situation may have prevented the incident.

Recommendation #3: Employers should use a particularly high-visibility device at the beginning of road channelizing demarcation to increase the visibility of the impending hazard.

Discussion: The plastic cones used as channelizing devices to demarcate the work zone did not gain the attention of the driver of the intruding vehicle. The use of barrels as channelizing devices for closing the lane at the entrance to the work zone may serve to better attract the attention of a driver to the impending hazard posed by the roadside work. This type of device must be positioned at a sufficient distance from worker positions so that flying debris does not strike workers should a motor vehicle strike the device. If the employers are not capable of providing sufficient traffic control or do not have adequate equipment, they should contract with a traffic control company to provide the necessary services.

Recommendation #4: Employers should ensure that a competent person evaluates the site before work begins, and re-evaluates the site during the work process, in order to provide a safe work zone free of hazards to employees and the public.

Discussion: All work sites must be monitored or inspected by a competent person to ensure that all necessary safety measures are in place and that they remain in place during the entire operation. A competent person is someone with experience and thorough knowledge of OSHA regulations and standards, gained through formal training and job-related experience. The evaluator must be aware of employee safety requirements, job-specific hazards, and the necessary corrective actions to eliminate or reduce hazards.

In a traffic work zone setting, it is imperative that the site be re-evaluated upon return from any situation where employees leave the site unattended. These situations might include lunch breaks, obtaining additional equipment, shift changes, or the end of the workday. Since traffic is a constant variable, there is a possibility of barriers, cones, or devices being struck, moved, or removed. In addition, this incident also involved a confined space (i.e., the manhole), which is an enclosed or partially enclosed area big enough for a worker to enter. Tasks that require the use of a confined space may necessitate a more formal plan of work with documented procedures and training for entering, re-entering, exiting, and working around the confined space.

Recommendation #5: Employers should ensure that all employees receive documented training regarding the hazards of work zone activities, such as parked vehicle positioning, positioning of employees, line-of-sight issues, and proper placement of work zone barriers and control devices.

Discussion: All employees should be trained on the OSHA standards and regulations applicable to their job tasks and responsibilities. Specific regulations apply to setting up and maintaining the safety and security of work zone sites. Employees assigned to work zone sites should be trained on the procedures and recommendations in the MUTCD, in addition to OSHA regulations and standards. Issues to discuss include, but are not limited to, wearing personal protective equipment, proper positioning of work vehicles and equipment, facing traffic, and hazard identification and correction. Training should also include the procedures involved in assessing the safety of a work zone, contacting an outside traffic control company, and getting an evaluation from a competent person. OSHA mandates formal documentation of each training session, which should be kept on file with the employer.

Recommendation #6: Employers should develop and implement a formal occupational health and safety management system that is focused on continual improvement.

Discussion: The dynamic nature of the contemporary workplace necessitates a management model that ensures continual improvement in virtually all aspects of the business. This principle is particularly critical with regard to the management of workplace health and safety, which must be integrated into all operational aspects of an organization's business plan. While implementation of a formal management system may or may not have directly prevented the incident, it could have encouraged and facilitated the identification and correction of deficiencies, which may have served as contributing causes. Implementation of a management system is a useful and achievable goal for any employer that seeks to reduce occupational injuries and illnesses.

REFERENCES

- U.S. Department of Transportation, Federal Highway Administration. *Manual on Uniform Traffic Control Devices, Part IV—Standards and Guides for Traffic Controls for Street and Highway Construction, Maintenance, Utility, and Incident Management Operations.*
- National Institute of Occupational Safety and Health. *Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment*, Publication No. 2001-128, April 2001.
- 29 CFR 1926.200. *Safety and Health Regulations for Construction, Accident Prevention Signs and Tags.*
- 29 CFR 1926.201. *Safety and Health Regulations for Construction, Signaling.*
- 29 CFR 1926.202. *Safety and Health Regulations for Construction, Barricades.*

The Oklahoma Fatality Assessment and Control Evaluation (OKFACE) is an occupational fatality surveillance project to determine the epidemiology of all fatal work-related injuries and identify and recommend prevention strategies. FACE is a research program of the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research.

These fatality investigations serve to prevent fatal work-related injuries in the future by studying the work environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in injury, and the role of management in controlling how these factors interact.

For more information on fatal work-related injuries, please contact:
Oklahoma State Department of Health, Injury Prevention Service
1000 NE 10th Street, Oklahoma City, OK 73117-1299
nancyk@health.ok.gov
1-800-522-0204 or 405-271-3430
www.health.state.ok.us/program/injury