



FACE

Fatality Assessment and Control Evaluation Program

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Highway Construction Supervisor Dies After Being Backed Over By a Water Truck-South Carolina

SUMMARY

On June 17, 2005, a male roadway construction supervisor died after being backed over by a water truck at a roadway construction site. The victim was part of a seven-man crew performing a milling operation on a 2,200-foot-long and eight-foot-wide blacktop berm of a recently paved section of a four-lane state highway. Due to a quality control problem, the blacktop berm had to be taken up and replaced. The milling machine had the capacity to remove a six-foot-wide section of the berm at a time. The crew had completed the six-foot-wide milling operation on the 2,200 foot section of the berm and had decided to mill the remaining two feet of berm before quitting for the day. A tractor equipped with a road sweeper was positioned behind the milling machine and the water truck was positioned beside the milling machine in the closed right side, westbound lane of the highway. The supervisor jumped onto the running board of the water truck and instructed the driver to return to the starting point of the milling operation and to apply water to the remaining two feet of the berm. The driver began to back the truck the 2,200 feet to the starting point. After dismounting the truck's running board, the supervisor walked around the tractor and into the path of the backing water truck. The two rear passenger-side truck axles backed over the supervisor before the tractor operator could alert the truck driver. A crew member called 911 from a company cell phone while other crew members moved the victim from underneath the truck. The victim was breathing and vital signs could be detected. The victim was transported to the hospital where he was later pronounced dead by the attending physician.

NIOSH investigators concluded that, to help prevent similar incidents, employers should:

- *ensure that workers on foot remain clear of moving equipment*
- *consider the use of electronic signaling devices or sensors to warn equipment operators of workers on foot in the immediate work area*

Fatality Assessment and Control Evaluation (FACE) Program

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatality Assessment and Control Evaluation (FACE) investigations when notified by participating states (Maryland, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia and West Virginia); by the Wage and Hour Division, Department of Labor; or when a request for technical assistance is received from NIOSH-funded state-level FACE programs in California, Iowa, Kentucky, Massachusetts, Michigan, New Jersey, New York, Oregon and Washington. The goal of FACE is to prevent fatal work injuries by studying the work environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact. FACE investigators evaluate information from multiple sources that may include interviews of employers, workers and other investigators; examination and measurement of the fatality site, and related equipment; and review of records such as OSHA, police, medical examiner reports, and employer safety procedures and training records. The FACE program does not seek to determine fault or place blame on companies or individual workers. Findings are summarized in narrative reports that include recommendations for preventing similar events in the future. For further information visit the FACE website www.cdc.gov/niosh/face or call toll free **1-800-CDC-INFO** (1-800-232-4636)

- *ensure that backing procedures are in place for the use of mobile construction vehicles, and use spotters for assistance when backing trucks and equipment in the work zone*

Additionally;

- *Manufacturers of heavy construction equipment, such as water trucks, should explore the possibility of incorporating new monitoring technology (e.g., radio frequency identification (RFID) tags and tag readers) on their equipment to help monitor the presence of workers on foot in blind areas*

INTRODUCTION

On June 17, 2005, a 53-year-old male roadway construction supervisor died after being backed over by a water truck at a roadway construction site. On June 20, 2005, the company's corporate safety officer notified the Division of Safety Research (DSR) of the incident. On August 29-30, 2005, a DSR senior investigator conducted an investigation of the incident.

The case was reviewed with two company corporate safety officers, the South Carolina Occupational Safety and Health Administration (SCOSHA) compliance officer assigned to the case, and the county coroner. The coroner's report was reviewed. The incident site was visited but it could not be determined exactly where the incident took place since work on the project had been completed.

The employer was a roadway construction company that had been in business under the present ownership since 2003 and employed between 1,200 and 1,400 workers, including five corporate safety officers. The employer had a comprehensive safety and training program. Training was conducted both in the classroom and on the job. A one-day orientation was conducted for new employees. This included watching videos on topics such as personal protective equipment, safety at the worksite, excavation, and vehicle and equipment backing. All safety materials were presented to Hispanic workers in Spanish. Supervisors had to complete the OSHA ten-hour course on workzone safety and the company-developed workzone supervisor training program. The victim had completed this training. Flaggers had to complete a flagger certification program. The victim had worked for the company for five years and had over twenty years of experience. The safety officers stated that the victim was very safety conscious. The safety officers also stated that the company had policies and procedures in place to limit the backing distances of equipment and vehicles. The water truck was not in the area and could not be photographed, nor could the dimensions of the truck be determined. The SCOSHA compliance officer stated that the truck's back up alarm was functional as were the truck's mirrors. The supervisor was wearing a high visibility vest and hard hat. This was the first fatality experienced by the present ownership. The previous owners experienced a fatality in 1994.

INVESTIGATION

The employer had been contracted by the state Department of Transportation to repave a 2,200 foot-length of one and a half-inch thick blacktop on a four-lane state highway that ran in an east and west direction. The contract also called for an eight-foot-wide blacktop berm to be applied on each side of the highway.

After this work had been completed, the company's quality control department identified an unspecified problem with the blacktop on the westbound berm and determined that it would have to be milled up, hauled back to the blacktop plant, and new blacktop would be applied.

On Friday June 17, 2005 the work began at 7:00 am. A milling machine and a broom tractor had been previously transported to the site. The seven-man crew consisting of the supervisor, the water and dump truck drivers, the broom tractor and milling machine operators and two laborers drove their personal trucks, a water truck and a dump truck to the site. Paving equipment had also been transported to the site and was located in a staging area approximately one quarter mile eastbound behind the milling operation with the personal vehicles. The supervisor was responsible for safety at the site.

As the blacktop was milled up and the dump truck was loaded, the truck transported the blacktop and dumped it at a batch plant approximately seven miles away from the site. This batch plant would also provide the blacktop to be re-applied.

The milling machine had a six-foot cutting capacity. The crew decided to mill a six-foot-wide section of the entire 2,200-foot berm, then return the equipment to the starting point and mill the remaining two-foot width of blacktop.

The work progressed until 5:30 p.m., when the last of the six-foot section had been milled. The seven-man crew decided that, since it was Friday afternoon, they would back the milling machine and tractor to the starting point and mill the remaining two feet of blacktop so that they could begin reapplying the blacktop at the start of work the following Monday morning.

After the dump truck pulled out to transport the blacktop to the batch plant, the broom tractor pulled behind the milling machine. The water truck pulled into a location adjacent to the milling machine (Diagram). The supervisor hopped onto the passenger-side running board of the water truck to further discuss with the driver what they would do next. It could not be determined if the supervisor discussed with the water truck driver whether to back his truck to the starting point or to use a lane crossover in the highway less than a quarter mile down the highway, east of the machinery. The supervisor then hopped down from the running board and walked around the tractor into the path of the backing water truck (Diagram). It is unknown why the supervisor traveled the path he did. The supervisor was backed over by the two rear axles of the water truck. The broom tractor operator saw what happened and jumped onto the running board to tell the driver to stop. The supervisor was pulled out from underneath the water truck and 911 was called from a cell phone. He was breathing and vital signs could be detected. When 911 arrived approximately 15 minutes later, they transported the supervisor to the hospital where he was pronounced dead by the attending physician.

CAUSE OF DEATH

The attending physician identified the cause of death as multiple trauma.

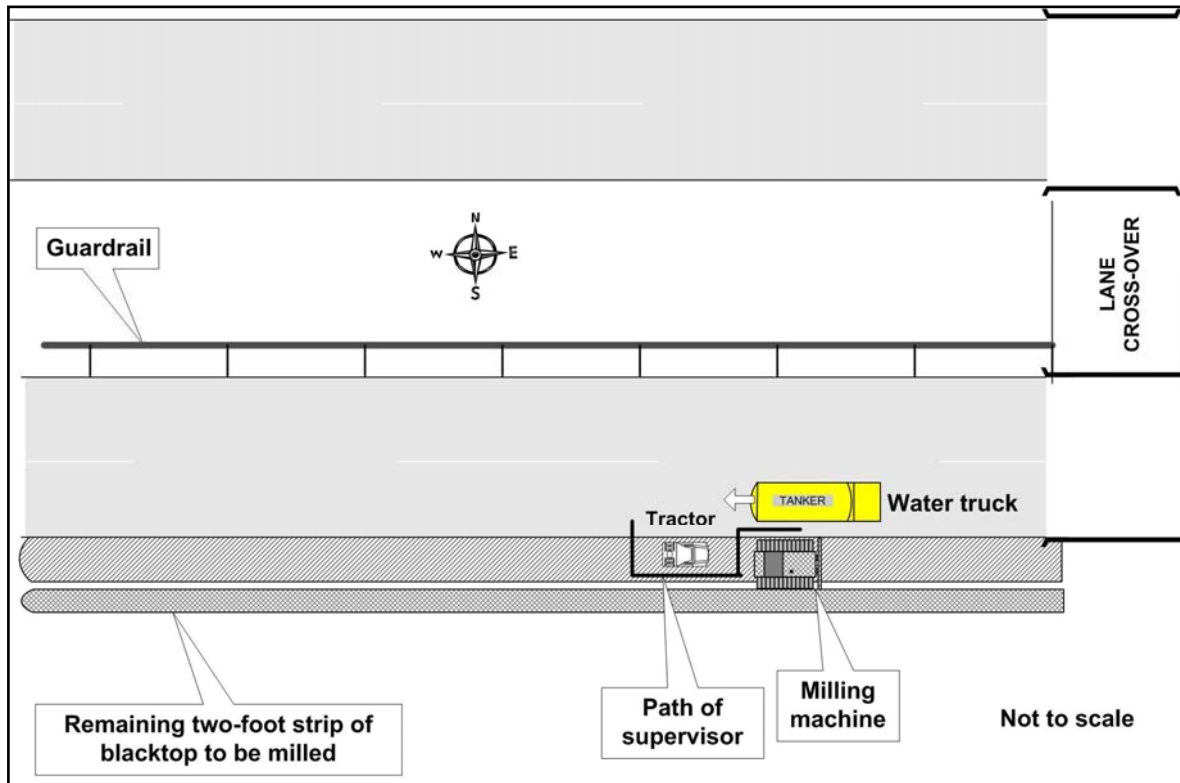


Diagram. Incident Scene

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that workers on foot remain clear of moving equipment.

Discussion: The “Internal Traffic Control Plan” (ITCP) is one example of how workers’ on foot exposure to moving vehicles can be limited. The ITCP defines processes and procedures for worker safety within the work zone. The policies and procedures in the ITCP should be developed to minimize worker exposure to moving vehicles. The elements of the ITCP should indicate where and how construction equipment, vehicles, and workers on foot interact within the work zone. The plan must also take into consideration the changing aspects of a work site and possible emergency situations that might occur.

The victim in this incident, the crew supervisor, was a worker on foot. The supervisor was discussing with the equipment operators the movement of the equipment back to the starting point of the milling operation in order that the final two-foot strip of the asphalt could be removed. It could not be determined if there was a discussion as to what exact steps would be taken to return the equipment to the starting point of the milling operation. During the planning phases of construction projects, the ITCP should outline the exact steps that would be taken to complete a project. As operations progress and conditions change (e.g., when the six-foot pass was completed), the ITCP should be reviewed and changed as needed. For instance, the ITCP should cover how equipment was to get

back to the starting point for the two-foot-wide milling task. The ICTP could indicate that the water truck is to pull forward to the highway crossover approximately one quarter mile in the eastbound lane and drive in a forward direction back to the starting point. Since the tractor and milling machine are not roadworthy, the ICTP should have procedures to safely return this equipment to the starting point. If there was sufficient room to turn this equipment around and drive in a forward direction back to the starting point, then this would be specified in the ICTP. If not, the ICTP procedures for safely backing equipment to the starting point should include which piece of equipment would back up first, what safe distance they would maintain between each other, what travel path the backing equipment would take, how equipment operators would know the path was clear, and how workers on foot would return to the starting point without walking in the path of backing equipment. The goal of the ICTP is to determine the safest possible methods to be used that would minimize the exposure of a worker on foot to moving equipment and vehicles. These methods should be determined prior to the start of the project and reviewed with crew members as the project progresses to minimize placement of workers on foot in hazardous areas around operating construction equipment. Additional safety information and recommendations for protecting roadway construction workers can be obtained from the NIOSH document entitled “Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment,”¹ and “Internal Traffic Control Plans”² developed by the Laborers’ Health and Safety Fund of North America under the Roadway Work Zone Safety and Health Coalition Alliance.

Recommendation #2: Employers should consider the use of electronic signaling devices or sensors to warn equipment operators of workers on foot in the immediate work area.

Discussion: Workers on construction sites often work in close proximity to moving heavy equipment. Being exposed on a daily basis to the noise and warning devices of backing equipment can desensitize individuals to the presence of such vehicles. Other devices such as a strobe light or different warning sounds should be considered as additions to the standard back-up alarm to warn workers of a backing vehicle.³ There are also devices available (e.g., radar and sonar systems) that can detect the presence of persons in the blind spots of vehicles and provide a warning to the driver. Rear-view cameras can be installed on equipment to provide visual coverage within vehicle blind spots. These additions should be considered in addition to the ICTPs.^{4,5}

Recommendation #3: Employers should ensure that backing procedures are in place for the use of mobile construction vehicles, and use spotters for assistance when backing trucks and equipment in the work zone.

Discussion: The roadway construction work zone can be a very confined and congested space. When a truck backs up in a work zone, there is an increased risk of collision with construction vehicles and equipment, or injury to workers on foot and equipment operators within the work zone. Truck drivers and other equipment operators must be informed about, and then adhere to, established traffic routes required by the prime contractor for travel through the work zone and they need to be observant and aware of activities, vehicles, and workers that may interfere with their ability to safely complete their task. Spotters on foot can help manage trucks and other construction equipment backing up in the work zone. The spotter provides the “vision” that the driver does not have when backing up and helps reduce “blind areas.” Policies should be developed that require spotters to wear high visibility

apparel, and should prohibit backing until a clear and understandable signal is received from a spotter that it is safe to begin backing.¹ Also, the importance of using proper backing procedures, to include the use of both side mirrors when backing, should be continually stressed during safety briefings and before the beginning of each work shift.

Recommendation #4: Manufacturers of heavy construction equipment, such as water trucks, should explore the possibility of incorporating new monitoring technology (e.g., radio frequency identification (RFID) tags and tag readers) on their equipment to help monitor the presence of workers on foot in blind areas.

Discussion: Emerging technology, such as sensor-based systems, rear-view cameras, and radio frequency identification (RFID) tags and tag readers are becoming available for construction equipment, though testing and demonstration at construction projects are still needed.^{1,3,4} Collisions between construction vehicles, equipment and workers have been attributed, in part, to limited visibility around the equipment. As new or existing monitoring technologies are proven to be effective on work sites, equipment manufacturers should offer these systems on new equipment.

Additional Information. The NIOSH Safety and Health Topic Page on Highway Work Zones is available at: <http://www.cdc.gov/niosh/topics/highwayworkzones/>.

REFERENCES

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INVESTIGATOR INFORMATION

This investigation was conducted by Virgil Casini, Senior Investigator, NIOSH Division of Safety Research, Surveillance and Field Investigation Branch, Fatality Investigations Team.