

**TO:** Director, National Institute for Occupational Safety and Health

**FROM:** California Fatality Assessment and Control Evaluation (FACE) Program

**SUBJECT:** Equipment Operator Dies After the Backhoe He Was Operating Rolled Off an Embankment in California

***SUMMARY***  
**California FACE Report #95CA010**

A 55-year-old male equipment operator (the victim) died from injuries he sustained after the backhoe he was operating rolled over the side of an embankment. The victim was performing road maintenance work using a backhoe to move dirt from an upper to a lower embankment as part of a road widening operation. After the backhoe went over the embankment, it travelled 30 feet before flipping onto its right side. The victim was not wearing a hard hat or a seat belt which allowed him to be thrown head first into the roll over protective structure (ROPS) bar located approximately four feet from his seat. A site safety inspection had been performed by management the day before the job was to have begun, but this information had not yet been discussed with employees when the incident occurred. The autopsy report indicated that the victim had a significantly elevated ethanol level. After the incident, the victim was transported by helicopter to a local hospital where he was pronounced dead. The CA/FACE investigator concluded that in order to prevent similar future occurrences employers should:

- require that all employees wear seat belts when operating large pieces of equipment such as backhoes.
- require that employees wear hard hats when operating large pieces of equipment.
- perform initial and ongoing hazard identification surveys and communicate these results to employees.
- familiarize themselves with the signs and symptoms of alcohol or drug use and/or dependence through educational and training sessions so that they may effectively intervene when indicated.

In addition, manufacturers and equipment designers should consider:

- designing backhoes with interlock systems that would prevent the machine from operating unless the seatbelt is fastened properly.

**INTRODUCTION**

On July 7, 1995, a 55-year-old male equipment operator died from injuries he sustained after driving a backhoe over the side of an embankment while doing road maintenance work. The CA/FACE investigator was informed of this incident by a California Division of

Occupational Safety & Health (Cal/OSHA) district office. A site investigation and employer interview was conducted by the CA/FACE investigator on July 13, 1995. Photographs of the incident site were taken and copies of the Cal/OSHA, fire department, and the Sheriff-Coroner's autopsy reports were obtained by the CA/FACE investigator.

The employer in this incident was an earth moving and engineering firm. They had been hired to perform road maintenance work on a narrow mountain road to correct storm damage from the previous winter. The company had been in business since 1952 under its current name and since 1940, under a different name. There were approximately 26 workers employed by the company at the time of the incident, 20 in the field, and six in the office. The victim had worked with his employer for approximately two years. The employer provided a copy of their Illness and Injury Prevention Program (IIPP) which partially satisfied the requirements under Title 8 of the California Code of Regulations (CCRs), Section 1509. They failed to maintain any type of written documentation for this program in the field as is required under Title 8 of the CCRs.

There was a safety officer on site at the time of the incident and he devoted approximately 25% of his time to safety issues. The employer stated that the victim had received general safety training on the following topics: personal protective equipment, hazard identification, right to know, workplace safety, and machinery and equipment. There were also documented records of safety meetings which the victim attended on issues such as seat belts, back up alarms, traffic control, and underground utilities.

## **INVESTIGATION**

At approximately 8:05 a.m. on the day of the incident, the victim was removing dirt using a backhoe with a front-end loader attachment. The length of the backhoe was 8 feet 7 inches from the rear axle to the front grill. He was scooping the dirt with the front-end loader and then turning the backhoe around in order to move the dirt from an embankment located above a narrow mountain road to an embankment located below the road. The purpose was to widen the road in an area damaged from previous winter storms. The road was 14 feet wide, relatively level, and consisted primarily of dirt. An inspection of the worksite had been conducted on the previous day, before the job began, by the company owner and the project foreman. However, this information had not yet been discussed with employees when the incident occurred.

The victim's employer and co-workers stated that the victim had finished depositing the dirt and was in the process of turning around when the backhoe rolled over the embankment. He had been at work for approximately 15-20 minutes and was completing his second turn. The backhoe continued down the hill approximately 30 feet before rolling onto its right side. The victim was not wearing a hard hat or seat belt which allowed him to be thrown from his seat into the ROPS. He hit his head on the corner of the ROPS which was located approximately four feet from his seat.

Co-workers came to the victim's aid in approximately one minute. They found him lying upside down inside the backhoe, and according to one co-worker, he was talking when they first arrived. The co-workers carried the victim up the hill from the backhoe to the mountain road. They summoned emergency services with a cellular phone that belonged to one of the victim's co-workers. A fire department helicopter was dispatched and arrived at 8:29 a.m. The victim was flown to a local hospital where he was pronounced dead at 9:36 a.m. by an emergency department physician.

The employer stated that the backhoe was equipped with a seatbelt and that company

operating rules mandated its use. All employees were also required to wear hard hats by their employer while they were at work in the field. However, this rule was not enforced by the employer when employees were working with backhoes because all backhoes were equipped with a cage. According to the company, the cage protected them from falling objects. It was discovered upon autopsy that the victim had a significantly elevated ethanol blood level. The employer stated that they were unaware that the victim had been drinking prior to beginning work. They also stated that they did not permit any employee to work if the employee was suspected of drinking. According to the employer, no prior incidents regarding the victim and the use of alcohol during or before work had occurred.

### **CAUSE OF DEATH**

The Sheriff-Coroner's Autopsy Report stated the cause of death to be craniocerebral trauma, with acute ethanol intoxication.

### **RECOMMENDATIONS/DISCUSSION**

#### **Recommendation #1: Employers and contractors should require that all employees wear seat belts when operating large pieces of equipment such as backhoes.**

Discussion: In this incident, the victim was not wearing a seat belt, though the backhoe was equipped with one. The employer also had a well documented safety training program which specifically included seat belt training. Often, however, there is a need for retraining and visual reminders which help employees to remember to use such equipment on a regular basis.

Additionally, a strict management enforcement program, including progressive disciplinary action, should be administered when violations occur. The use of a seat belt would have kept the victim restrained and may have prevented his death. Under Title 8 of the California Code of Regulations (CCRs), Section 1596 (a): "Installation Schedule. ROPS and seat belts (see Section 1596(g)) shall be installed and used on all equipment specified in this section...for each type or use of equipment listed below: NOTE: the provisions of this section do not apply to non-rider equipment. (1) scrapers, tractors, front-end loaders, bulldozers, motor graders and water wagon prime movers having brake horsepower ratings above 20."

#### **Recommendation #2: Employers should require that employees wear hard hats when operating large pieces of equipment.**

Discussion: The most serious injury to this victim occurred when his unprotected head struck the ROPS. In this situation, wearing a hard hat was not required by regulation, nor was it strictly enforced by company policy. However, companies should require that employees who perform potentially dangerous operations wear a hard hat. The hard hat should be equipped with a chin strap to prevent its dislodging in an event such as this one. In this situation, the ROPS protected the victim from falling objects, but he was not protected from injuries from unrestrained body movements. Had the victim been wearing a hard hat, it may have lessened the severity of his injuries, even if his head had struck the ROPS.

**Recommendation #3: Employers should perform initial and ongoing hazard identification surveys and communicate these results to employees.**

Discussion: In this situation a hazard identification survey was performed prior to initiating this job, but the information had not been communicated to employees prior to starting work.

Regular safety inspections assist both the employer and employees in raising their awareness regarding hazards to which they are exposed. Even though safety inspections do not guarantee the prevention of occupational injury, they are key to identifying activities where special caution would need to be exerted, such as maneuvering a large backhoe on narrow road. This incident may have been prevented if a more active and collaborative approach to safe work practices had been initiated in the field.

**Recommendation #4: Employers should familiarize themselves with the signs and symptoms of alcohol or drug use and dependence through educational and training sessions so that they may effectively intervene when indicated.**

Discussion: In this situation, upon autopsy, the employee was found to have had a significantly elevated ethanol level. The incident occurred early in the morning within the first 15-20 minutes of work. This worker was a long time employee of the company. Although the employer had a strict policy prohibiting any employee from working who had been drinking, they were unable to recognize the signs of symptoms of excess alcohol use. Management training may have helped the employer and other supervisors to recognize the signs and symptoms of alcohol use. Had they received such training, they may have been able to more effectively intervene in preventing the employee from working that day and assisting him in obtaining treatment for his disability.

**Recommendation #5: Manufacturers and equipment designers should consider designing backhoes with interlock systems that would prevent the machine from operating unless the seatbelt is fastened properly.**

Discussion: In this situation, there was no mechanism for preventing operation of the backhoe if the seatbelt was not fastened, other than administrative controls. Interlock systems are not required by regulation, however, they are currently in place in some commercial vehicles.

Although interlocks can be bypassed, their use may help to reduce the risk that employees will fail to use the seatbelt through simple memory lapse or intentional disregard. Had the machine been equipped with a fail safe mechanism, this fatality may have been prevented by keeping the operator in his seat rather than being thrown head first into the ROPS.

**References**

Barclays Official California Code of Regulations, Vol. 9., Title 8, Industrial Relations. South San Francisco, CA, 1990.

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**FACE Investigator**

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**FACE Project Officer**

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**FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM**

The California Department of Health Services, in cooperation with the Public Health Institute and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations of work-related fatalities. The goal of this program, known as the California Fatality Assessment and Control Evaluation (CA/FACE), is to prevent fatal work injuries in the future. CA/FACE aims to achieve this goal 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. NIOSH-funded, state-based FACE programs include: Alaska, California, Iowa, Kentucky, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New York, Oklahoma, Oregon, Washington, West Virginia, and Wisconsin.

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**Additional information regarding the CA/FACE program is available from:**

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