

TO: Director, National Institute for Occupational Safety and Health

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

SUBJECT: Heavy duty equipment operator is crushed when front-end loader falls off a trailer during backing in California

Summary
California FACE Report #97CA011

A 65-year old heavy duty equipment operator (decedent) died when multiple parts of his body were crushed between the side of a track-driven front-end loader and a concrete curb. The decedent was backing the front-end loader off a low-bed trailer in anticipation of using it to level a pad for a new home. While backing it off, the front-end loader went off the right side of the trailer. The decedent attempted to jump free, but was pinned underneath the machine. The front-end loader had a rollover protective structure (ROPS) and a seat belt which the decedent did not use. The decedent, an owner-operator of a bulldozer, had borrowed this piece of equipment and had limited experience in its operation. No written documentation of a safety program, instructions for off-loading the equipment, or training were available. The CA/FACE investigator recommends that, in order to prevent future occurrences, employers should:

- ensure that ROPS equipped-front-end loader operators stay in their machines with their seatbelts fastened when operating the machine, even if it is in danger of rolling over.
- require operators to demonstrate operating proficiency before they use a particular type of machine
- develop and use as a training tool, a written procedure for off-loading equipment from trailers.

Additionally, manufacturers should:

- install seatbelt interlocks so that machines of this type cannot be started or operated without the seatbelt properly fastened.

INTRODUCTION

On December 29, 1997 at 1:18 p.m. a 65-year old male heavy duty equipment operator died after he was crushed by a track-driven front-end loader when unloading it. He was attempting to back the front-end loader off a low-bed trailer when the front-end loader fell off the side of the trailer. The decedent tried to jump out of the machine but was pinned between the side of the loader and concrete curb.

The CA/FACE investigator learned of this fatality on January 8, 1998 from the county coroner's office. The CA/FACE investigator inspected the front-end loader at a storage yard on January 12, 1998. The CA/FACE investigator interviewed the owner of the front-end loader. He interviewed the tractor-trailer driver on February 5, 1998 and traveled to the trucking company where the low-bed trailer was stored on February 6, 1998 at which time the owner of the company was interviewed and photographs of the trailer were taken. Copies of the police report, coroner's report, and death certificate were obtained by the CA/FACE investigator.

The decedent was an owner-operator and had no employees. The decedent had been performing work as a heavy equipment operator for 42 years. He had been hired by a development firm that builds new homes. This was his first day on this job and, the first time he had attempted to unload this front-end loader off a trailer. Although he had used this front-end loader twice before, he had limited experience with its controls.

INVESTIGATION

The site of this incident is a large, hilly area where new homes are being built. The job was to level a pad for the construction of a new home. On the day of the incident, the tractor-trailer driver arrived with the front-end loader secured on his low-bed (low-boy) trailer. The driver backed the trailer up a concrete driveway near the area where the pad was to be leveled.

This placed the trailer on a 6 to 12 percent grade necessitating the front-end loader be backed off uphill.

The reason that the unloading was performed on such a steep slope is due to the fact that tracks of the front-end loader would ruin a very expensive stone-paved driveway if it was unloaded and driven over the driveway from a lower portion of the property. According to the owner of the trucking company, the slope presented no problem to the front-end loader as far as the unloading operation. There was a danger that the tractor-trailer rig could run away. When a front-end loader of this size backs off the very end of a low-bed trailer parked on a grade this steep, the front of the trailer and back of the tractor can be lifted up. This can cause the parking brake of the tractor to fail to operate.

It is normal procedure for the tractor-trailer driver to off-load the equipment. Since the decedent indicated to the tractor driver that he was capable of backing the front-end loader off the trailer and was not familiar with the controls of the tractor, the tractor driver stayed in his rig. The decedent climbed into the front-end loader to begin the unloading operation.

The front-end loader weighed 37,500 pounds and its bucket had a capacity of 2.25 cubic yards. It measured 17 feet, 4 inches long and 8 feet wide. The loader was equipped with a rollover protective structure (ROPS). Just prior to this incident, the tracks of the front-end loader had been serviced (pins turned) and cleaned, and their operation checked. The low-bed trailer measured 8 feet, 5 1/2 inches wide. The wooden portion of the trailer measured just over 28 feet long. The front-end loader was placed on the wooden portion of the trailer with the bucket down and up against the yoke of the trailer.

The operation was to back the front-end loader straight back off the wooden portion of the trailer and up a small, cleated ramp of the trailer that lifts the tracks over the rear tires of the trailer. The front-end loader would then continue backing over the tires, onto metal plates to the rear of the tires, and then down ramps attached to the back of the trailer.

The decedent had asked, at the end of November to rent this particular front-end loader for this job. He had operated this front-end loader twice before, but had his own bull-dozer which he normally operated. The front-end loader was serviced just before the Christmas

holidays. The tracks were removed, cleaned and serviced as part of the maintenance procedure.

As the decedent began to back the loader off the trailer, the tractor driver noticed that his rig was jerking as the decedent was moving the loader back and forth a number of times. It was unusual to experience such jerking. As the tractor driver watched in the tractor's mirrors, he noted that the front-end loader seemed to be moving to the right side of the trailer with each motion the decedent performed. As the decedent continued his backing efforts, the front-end loader suddenly fell off the right side of the trailer and tipped over onto its right side.

As the front-end loader began to fall off the trailer, the decedent, who was not wearing his seat belt, attempted to jump out of the right side of the loader. He landed on a high, concrete curb that bordered the driveway. When the front-end loader tipped over, it pinned his left pelvic area between the side of the loader and the concrete curb. The remainder of his body, still located inside the ROPS, was lying in the dirt on the other side of the curb. The tractor driver immediately got out of his cab and ran to help the decedent. He dug some dirt from under the decedent in an attempt to free him and get the weight off his hip. He was successful and was able to pull him a short distance out from under the equipment. The decedent also pulled himself a short distance and then laid on his back.

The developer, also on site, arrived and talked to the decedent. The tractor driver also spoke briefly to the decedent. When the police officers arrived they shouted his name and the decedent responded by opening his eyes. The paramedics were dispatched at 12:28 p.m. and arrived at 12:31 p.m. They found the victim in full arrest and the paramedics began CPR. The decedent was transported to a local hospital where he was pronounced dead at 1:18 p.m.

Subsequent investigation indicated that the front-end loader went over the side of the wood portion of the trailer. There were distinct scrape marks left by the tracks. This indicates that the front-end loader was not moved very far back from its original, loaded position. When the decedent jumped his unprotected head made contact with the frame of the ROPS evident by blood on the frame and head injuries consistent with the incident.

CAUSE OF DEATH

The death certificate stated the cause of death to be multiple traumatic injuries.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that ROPS equipped-front-end loader operators stay in their machines with their seatbelts fastened when operating the machine, even if it is in danger of rolling over.

Discussion: The decedent in this incident did not use his seatbelt. He jumped off the machine when it was thought to be in danger of rolling over when it began to fall off the trailer. His front-end loader was equipped with a proper, factory-installed ROPS which is designed to protect the operator's station in the event of a rollover. Had the front-end loader operator kept his seatbelt fastened and remained in the cab, he most likely would have suffered few if any injuries.

Recommendation #2: Employers should not allow operators to use a particular type of machine until they have demonstrated operating proficiency.

Discussion: Although the decedent had operated the front-end loader involved in this incident on a two prior occasions, he did not usually operate this piece of equipment. This was also the first time the decedent had backed this front-end loader off a trailer. He normally operated his bulldozer, which uses hand levers to turn right and left and foot controls for other functions. This front-end loader uses foot controls for all functions. The owner of the equipment speculated that when the decedent got into trouble during the backing operation, he instinctively pushed a foot pedal. The foot pedal he may have pushed in this instance would have been the one that causes the machine to turn right. Since the trailer was only one-half foot wider than the width of the tracks of the front-end loader, there was not much room for error. Normally, according to the trucking company owner, this type of machine would back straight off the trailer without any need to touch the turning controls. It is unknown why the decedent had so much trouble backing the loader off the trailer, but it was most likely due to inexperience in close quarters operation.

Recommendation #3: Employers should develop, and use as a training tool, a written procedure for off-loading equipment from trailers.

Discussion: Anyone using equipment such as the front-end loader involved in this incident should be trained, under supervision, until they can safely perform all operations that the machine may perform. Formal, written procedures, allow all trainees to obtain the same training and information. If properly prepared and carried out, the training procedures can prepare operators for safe operation in all circumstances. It is important to conduct such training for each type of machine operators will use. If properly trained in the safe operation of each machine, operators will be much less likely to incur an incident causing damage, injury or death.

Recommendation #4: Install seatbelt interlocks so that machines of this type cannot be started or operated without the seatbelt properly fastened.

Discussion: Operators often neglect to fasten their seatbelts when operating machinery of the type involved in this incident. This front-end loader was equipped with a roll-over protective structure (ROPS). It is unlikely that an operator would be seriously injured if a ROPS vehicle rolled over with the operator in his/her seat with his seatbelt properly fastened. This suggests that manufacturers should install interlocks which prevent the starting or operation of the vehicle until the operator properly fastens the seatbelt. Since the ROPS of the front-end loader was intact after this incident, it is likely that the operator would not have been seriously injured if he would have had his seatbelt properly fasten and remained in the vehicle. Seatbelt interlocks, however, can easily be bypassed or disconnected. Thus training and proper supervision is necessary to ensure that this does not occur.

References

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FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Health Services, in cooperation with the California Public Health Foundation, and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations on 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, Georgia, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma and Wisconsin.

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

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