

Kentucky

Fatality

Public Health

Assessment and

KY FACE #00KY096

Control

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Evaluation Project

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SUBJECT: Construction Worker Dies After Being Struck by a Falling Excavator Bucket

SUMMARY

A 44-year-old construction worker (victim) was killed when a 36-inch-wide bucket weighing more than 1000 pounds, detached from its quick release coupler and fell from an excavator, landing on him as he was working in a trench. The victim and another worker had been in the trench preparing it for a pre-formed concrete manhole that they were about to install. Their supervisor (the excavator operator) sat and waited in the excavator, with the engine running, and the bucket raised a few feet above ground level so that it would be out of the way. The second man in the trench had just turned away from the victim when he heard a "click" and turned back to see the bucket fall. He attempted to move the bucket, but could not. He and the excavator operator used the excavator and a chain to remove the bucket and then called for help. The victim was pronounced dead at the scene upon arrival of emergency medical workers. In order to prevent similar instances from occurring, FACE investigators recommend that:

- Workers should not work under heavy machinery
- A manual-locking pin, although it would require the operator to exit the cab or another worker on the ground to disengage, would dramatically increase the safety of those working with and around the equipment and should be a part of all quick release couplers. Also, the control panel for quick release couplers for heavy equipment should have only two positions, lock and unlock. When in the unlock position, there should be indicator lights as well as audible warnings to alert the operator and others nearby to the coupler's status. The lights should be mounted in a highly visible area.
- All equipment should be maintained properly, including routine maintenance as recommended by the manufacturer as well as unscheduled repair and replacement of missing, damaged, or worn parts.
- Trenches deeper than five feet should have the walls shored for workers protection.

INTRODUCTION

On November 13, 2000, FACE investigators were notified of a 44-year-old male construction worker who had been killed on November 10, 2000, when an excavator bucket released from a quick connect coupler and fell on him. On that same day, a telephone interview was conducted with the county coroner who responded to the scene, and an investigator traveled to the incident site. Photographs were taken and the various parties present, which included the construction company's vice president, a representative from the coupler's manufacturer, and an independent mechanic brought in to test the equipment involved, were interviewed. A copy of the coroner's report and the death certificate were obtained, as was a copy of the mechanic's report.

The victim had been employed by this particular company off and on for about a year, and had most recently been with them for about 2 months. The equipment operator had worked in construction for approximately 30 years. He had been with this company for four years and had operated the excavator involved in the incident for the same duration. The company was sub-contracting for the general contractor on this project. They had been at this location approximately 3 months, and on the specific task at hand when the incident occurred for about two weeks.

The construction company had been owned by the current owners for 12 years and employed about 60 full time employees and approximately another 55 seasonal and part-time employees. They had a written safety manual that was distributed to all employees upon hiring, and conducted jobsite toolbox safety meetings weekly as well as company wide safety meetings at company headquarters monthly. Both the victim and the equipment operator had received the written safety manual and participated in the safety meetings.

INVESTIGATION

The workers began their shift on the day of the incident at 3 p.m., and were scheduled to leave at 10 p.m. The weather was cloudy and the temperature about 45 degrees. They had dug a trench with a hydraulic excavator, and were preparing the trench for a pre-formed concrete manhole that they were about to install. Once they had the trench prepared, they planned to use the excavator and a chain to hoist the manhole and lower it into place. Although the quick disconnect coupler that was installed on the excavator was intended to allow for situations such as this when it may be desired to remove the bucket for increased visibility or lifting capacity, they typically did not disconnect the bucket for this type of procedure unless necessary, and had no intentions of doing so in this instance. Instead they planned to use a ring on the bucket to attach the chain. The bucket, in fact, had not been removed from the excavator for approximately two weeks. There were two men, the victim and a co-worker, in the trench that were grading and doing final preparations for the manhole, while a third, the excavator operator, remained seated in the excavator waiting for them to finish. During the approximately 5 minutes of waiting, the excavator's engine was running and the bucket was positioned up above ground level, over the trench, so that it would be out of the way of the men in the trench. The co-worker had turned away when he heard a click that caused him to re-direct his attention toward the sound just as the bucket, weighing more than 1000 pounds, fell from the excavator and landed on the victim. The co-worker attempted to move the bucket off of the victim, but could not due to its extreme weight. The excavator operator attempted to re-connect the bucket to the excavator in order to remove it, but was unable to align the coupler due to the angle of the bucket in the trench. Finally, working together, the excavator operator and the co-worker were able to use a chain and the excavator to lift the bucket off of the victim, immediately after which, the operator went and called the Emergency Medical Service (EMS). Although the EMS response time was only about one minute due to the urban location of the incident, the victim was pronounced dead at the scene upon arrival.

CAUSE OF DEATH

The cause of death was listed as multiple blunt force injuries.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Workers should not work under heavy machinery.

Discussion #1: Kentucky Revised Statute 338.031 (1)(a)¹ states that it is an obligation of the employer to provide a place of employment free from recognized hazards that are causing or likely to cause death or serious physical harm to his employees. In this case the employee was exposed to the hazard of being struck by the excavator bucket. This risk could have been eliminated if the bucket had been swung away from the trench and lowered to the ground. Workers should be instructed not to position themselves under elevated machine components.

Recommendation #2: A manual-locking pin, although it would require the operator to exit the cab or another on the ground to disengage, would dramatically increase the safety of those working with and around the equipment and should be a part of all quick release couplers. Also, the control panel for quick release couplers for heavy equipment should have only two positions, lock and unlock. When in the unlock position, there should be indicator lights as well as audible warnings to alert the operator and others nearby to the coupler's status. The lights should be mounted in a highly visible area.

Discussion #2: The excavator being used was equipped with a hydraulic quick release coupler that allows the operator to change buckets or attachments without leaving the cab. Although the use of a manually inserted locking pin may be a minor inconvenience, it would virtually eliminate the potential for inadvertent release of the bucket. A manually inserted locking pin would provide backup protection in the event of hydraulic leaks, switch and/or wiring malfunctions, and unintentional switch movement.

The quick release coupler on the excavator involved in the incident had a three-position switch mounted in the cab that controlled the coupler's locking mechanism. There were positive stops at the "lock" and "neutral" positions, and the third position, the "unlock" position springs back to "neutral." The neutral position cuts hydraulic flow to the coupler allowing for maintenance or repair. While the switch for the coupler involved in this incident did trigger an alarm if the switch was turned to the "unlock" position, upon release of the switch it would spring back to the "neutral" position and the alarm would be silenced. The switch would remain in this position until physically turned to the "lock" position by the operator. There also were no indicator lights to show the coupler's status. Due to the remote location of the switch (between the seat and the right external wall of the cab, about six inches below the level of the armrest) and its design, while probably not impossible, it is highly unlikely that the switch was bumped by the operator, causing the coupler to release. Also, the warning alarm never sounded during the incident yet was found to function perfectly in tests done after the incident, suggesting that the switch was not moved to the "release" position. In fact, the excavator passed all tests performed and the cause of the release has not been determined. Interestingly, the bucket of this excavator had not been off the machine for approximately two weeks prior to the incident. One possible scenario is that the switch could have been, for some unknown reason, in the "neutral" position without the operator's knowledge. If turned there from the "lock" position without going to the "release" position, the coupler would remain locked. And, although there is a check valve that prevents the sudden release of hydraulic pressure on the coupler, and, therefore, an unintentional release, this valve, if left to hold hydraulic pressure indefinitely, could feasibly allow a gradual leak to reduce the pressure

on the hydraulic lock and eventually allow an unintentional release of the coupler.

Recommendation #3: All equipment should be maintained properly, including routine maintenance as recommended by the manufacturer and unscheduled repair and replacement of missing, damaged, or worn parts.

Discussion #3: According to the Vice President of the construction company, the excavator did receive routine maintenance approximately every 200 hours. At the time of the incident, the hydraulic cylinder that operates the coupler locking mechanism was leaking, but not enough to cause a problem in the opinions of the coupler representative and the mechanic, and regardless, was not from the portion of the cylinder responsible for unlocking the coupler. There were also two springs on the coupler that were designed to help keep pressure on the coupler in the event of a loss of hydraulic pressure. One of these was missing. Again, it was generally agreed upon by the experts on the scene that this had no relevance to the incident. In fact, the excavator was put through a series of rigorous tests in an unsuccessful attempt to get the hydraulic coupler to improperly release. No one has figured out what happened and the incident could not be reproduced. Therefore, none of the defects can be eliminated from possible causes. Hydraulic leaks, missing springs, and other known maintenance issues, should be addressed immediately due to the increased potential for equipment malfunction or failure.

Recommendation #4: Trenches deeper than five feet should have the walls shored for workers protection.

Discussion #4: In this incident the victim was working in a trench that was 6'4" deep with walls that were not shored, which put both him and his co-worker at risk in the event of a cave-in. OSHA regulation 29CFR 1926.652 (a)(1)² states that employees in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with OSHA specifications. This pertains to all excavations. Permissible exclusions to this are when excavations are made entirely in stable rock, or in excavations less than five feet in depth that have been examined by a competent person and no indication of potential cave-in is seen.

References

1. KRS 338.031 (1)(a) Obligations of employers and employees. Kentucky Revised Statutes.
2. 29 CFR 1926.652 (a)(1) Requirements for protective systems. Occupational Safety and Health Administration. U.S. Department of Labor.