CDC Workplace Safety and Health

WORKPLACE SOLUTIONS

From the National Institute for Occupational Safety and Health

Preventing Injuries When Working with Hydraulic Excavators and Backhoe Loaders

Summary

Workers who operate or work near hydraulic excavators and backhoe loaders are at risk of being struck by the machine or its components or by excavator buckets that detach from the excavator stick. NIOSH recommends that injuries and deaths be prevented through training, proper installation and maintenance, work practices, and personal protective equipment.

Description of Exposure

A National Institute for Occupational Safety and Health (NIOSH) review of the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) data identified 346 deaths associated with excavators or backhoe loaders during 1992–2000 [NIOSH 2002]. Review of these data and of NIOSH Fatality Assessment and Control Evaluation (FACE) cases [NIOSH 2000, 2001] suggests two common causes of injury: (1) being struck by the moving machine, swinging booms, or other machine components; or (2) being struck by quick-disconnect excavator buckets that unexpectedly detach from the excavator stick. Other leading causes of fatalities are rollovers, electrocutions, and slides into trenches after cave-ins.

Case Study 1

A 28-year-old laborer died after he was struck by the bucket of a hydraulic excavator. The victim, a coworker, and the operator were using an excavator equipped with a quick-disconnect bucket to load concrete manhole sections onto a truck. The victim was on the ground to connect the manhole sections to the excavator while the coworker was on the truck to disconnect the sections after they had been loaded on the truck. The operator had positioned the excavator bucket near a manhole section while the victim attached a three-legged bridle to the manhole section for lifting. The bucket disconnected from the excavator stick (Figure 1) and struck the victim. He was pronounced dead at the scene [NIOSH 2001].

Case Study 2

A 32-year-old construction laborer died after being struck in the head by a backhoe bucket. The victim was part of a two-man crew clearing earth away from the foundation footing of

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Figure 1. Quick-disconnect excavator bucket that detached from the excavator stick.

a house. The backhoe operator began digging an approximately 2-ft-wide by 2-ft-deep excavation around the foundation while the victim used a hand shovel to remove extra earth after the backhoe had passed through. The amount of footing protruding was decreasing. The operator lowered the backhoe's bucket to rest on a pile of earth approximately 8 ft from the victim; he then dismounted from the backhoe to inspect the trench. When the operator returned to the machine and stepped over the tire to sit down, he inadvertently contacted the boom swing control, swinging the boom toward the victim standing in the trench. The boom struck the victim, pinning him against the house. He was pronounced dead at the scene [NIOSH 2000].

Controls

Employers should take the following steps to protect workers from injury while working with excavators or backhoe loaders.

Site Set-Up

- Contact local utilities and other responsible parties to locate overhead and underground utility lines before beginning work. Avoid working near overhead power lines. If you must work near them, develop a plan to avoid contact and to follow OSHA regulations for minimum clearance [29 CFR* 1926.550(a)(15)].
- Do not permit hydraulic excavators or backhoes to be operated on grades steeper than those specified by the manufacturer.
- Make sure that workers position machinery at a safe distance from excavations such as trenches.

Equipment Operators

- Train equipment operators in the proper use of the equipment they are assigned to operate. Be sure to follow manufacturers' specifications and recommendations.
- Continually evaluate safety programs to address changing conditions at the worksite.
- Clearly identify and label all machine controls and make sure that the manufacturers' safety features are working.
- Install and maintain equipment attachments and their operating systems according to manufacturers' specifications.
- Securely latch attachments (such as quick-disconnect buckets) before work begins.
- Follow the manufacturer's instructions for using positive locks on quick-disconnect equipment.
- Train operators to conduct visual and operational checks on all machine systems and operating controls before working the machine.
- Make frequent visual inspections of quick-disconnect systems—especially after changing attachments.
- Use the ROPS and seat belts supplied by the manufacturer. Do not remove the ROPS.
- Do not exceed load capacities when lifting materials.
- Instruct operators to lower the boom to a safe position with the bucket on the ground and turn off the machine before stepping off for any reason.

**Code of Federal Regulation*. See CFR in reference.

Other Site Workers

- Train site workers to recognize and avoid unsafe conditions and to follow required safe work practices that apply to their work environments.
- Make all workers on the site aware of the machines' established swing areas and blind spots before the operator works the machine. Keep workers on foot outside these areas by marking them with rope, tape, or other barriers.
- Before each work shift begins, review and confirm communications signals between machine operators and workers on foot.
- Instruct machine operators to keep the bucket as close to the ground as possible when workers are attaching loads for hoisting.
- Keep workers outside the hydraulic excavator swing areas and clear of attachments when using the machines for hoisting materials. Do not allow workers to stand under suspended loads or suspended machine components such as the boom, arm, or bucket.
- Do not permit workers on foot to approach the hydraulic excavator or backhoe loader until they signal the operator to shut down the machine and receive acknowledgment from the operator.
- Use spotters or signal persons around operating equipment when necessary.
- Never permit workers to ride in or work from excavator or backhoe loader buckets.
- Provide appropriate personal protective equipment and make sure that workers use and maintain it.

Acknowledgments

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The information in this document is based on data, FACE reports, and expert review. More information about the NIOSH FACE program is available at www.cdc.gov/niosh/face/faceweb.html

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As part of the Centers for Disease Control and Prevention, NIOSH is the Federal agency responsible for conducting research and making recommendations to prevent work-related illnesses and injuries. All Workplace Solutions are based on research studies that show how worker exposures to hazardous agents or activities can be significantly reduced.

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