

**ADMINISTRATIVE REPORT
PUBLIC HEALTH SERVICE/CDC/NIOSH/DSR
FACE 97-20**

DATE: November 5, 1997

TO: Director, National Institute for Occupational Safety and Health

FROM: Division of Safety Research, NIOSH

SUBJECT: Laborer Dies When Caught Between Boom Linkage Of Skid-Steer Loading Machine — North Carolina

SUMMARY

On July 6, 1997, a 25-year-old laborer (the victim) died after being caught in the boom linkage of a skid-steer loader. The victim and two other workers were clearing brush and tree stumps from a residential site. Using a skid-steer loader from which the side screens had been removed, the victim was gathering brush and stumps and loading them into a dump truck. While the victim was loading the truck, the other workers were working nearby. A resident who was in the area noticed that hydraulic fluid was spraying from the left side of the loader and notified one of the workers. When the worker went to the machine to check, he found the victim seated in the operator's seat with his head caught in the boom linkage and hydraulic fluid leaking from the bucket cylinder hydraulic line. The resident called 911 and notified another homeowner who was a county medical examiner. The medical examiner pronounced the victim dead at the scene. Emergency medical services responded within 10 minutes of notification, extracted the victim from the machine, and transported him from the site.

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

- o ensure that all guards, including side screens, are properly secured before skid-steer loaders are placed in operation
- o ensure that employees fully comprehend the necessity of maintaining pinch point guards such as skid-steer loader side screens in place
- o implement inspection programs to ensure that mobile equipment is maintained free of defects which affect safe operation.

INTRODUCTION

On July 6, 1997, a 25-year-old laborer for a tree-trimming service (the victim) sustained fatal injuries when he was caught in the left boom linkage of an operating skid-steer loader. On July 22, 1997, officials of the North Carolina Occupational Safety and Health Administration (NCOSHA) notified the Division of Safety Research (DSR) of the incident and requested technical assistance. On September 3, 1997, a DSR safety engineer reviewed the case with the investigating compliance officer and interviewed one of the witnesses to the event.

The employer was a tree trimming service in business for 1 year prior to the incident. The service employed two persons. The tree trimming service was operated in conjunction with a stump-grinding service operated by the employer's brother.

The employer addressed safety issues informally, with training being conducted on-the-job. This was the employer's first fatality.

INVESTIGATION

On the day of the incident the victim and the tree-trimming service owner arrived at the site at about 9:30 a.m. and began work. At about 10:30 a.m., the stump-grinding service owner arrived and began work. The three men had been engaged in clearing the site of brush and stumps for the previous 2 days and this was to be the last day on the job. The crew worked until lunch clearing stumps and brush from the site and loading the material into a dump truck for removal from the site. After lunch the owner of the stump-grinding service moved his equipment from the paved street onto the site while the tree-trimming service owner was cutting stumps. The victim, operating a New Holland skid-steer loader from which the side-screens had been removed, resumed gathering stumps and brush for loading into the dump truck until just before 1:00 p.m. when the incident occurred. The actual event was not witnessed; however, evidence indicates that the left main pivot pin connecting the lower boom link to the frame of the machine may have backed out of the connection. This would have allowed the base of the boom link to raise out of the joint and pinch the bucket cylinder hydraulic line against the boom cylinder causing a leak. As the victim was loading a log into the truck he may have noticed the spray of fluid and instinctively leaned to the left to locate the leak. While his head was within the plane of movement of the left boom linkage, he then inadvertently stepped on the foot-operated boom lift control, lowering the boom, or the boom descended due to a leak in the hydraulic lines. The victim's head was crushed by the descending boom linkage.

A homeowner who was in the area noticed hydraulic fluid spraying from the machine and notified the owner of the stump-grinding service, who went to the loader and found the victim caught in the boom linkage. The neighbor called 911 and notified a county medical examiner who lived nearby. The medical examiner pronounced the victim dead at the scene. Emergency medical services responded within 10 minutes of notification and removed the victim from the machine.

CAUSE OF DEATH

The medical examiner established the cause of death as crushed cranium due to heavy equipment accident.

RECOMMENDATIONS/DISCUSSIONS

Recommendation #1: Employers should ensure that all guards, including side screens, are properly secured before skid-steer loaders are placed in operation.

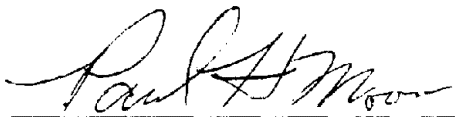
Discussion: Because the operator of a skid-steer loader is seated close to the boom linkage, the side screens are necessary to protect the operator from being caught by the moving boom linkage. The side screens are specifically intended to prevent the type of injury incurred by the victim in this incident. It is not known why the screens had been removed; however, witnesses indicated that the operator may have removed them after colliding with a brush pile. The screens of this machine are mounted within the frame of the rollover protective structure (ROPS) by a force-fit rubber gasket in the same manner that some automotive windows are secured. It is possible that the screen may have been punched out of the structure by a limb during the collision with the brush pile. The victim may have removed both screens rather than try to refit the dislodged one.

Recommendation #2: Employers should ensure that employees fully comprehend the hazards of operating equipment with unguarded nip points.

Discussion: The operator was probably aware of the need to remain outside the boom linkage plane of motion and believed that he could safely operate the machine without the side screens in place. However, he may have instinctively leaned toward the left side of the machine while the boom was raised in an effort to identify the source of spraying fluid, not realizing that he was inside the boom linkage motion plane. He may then have inadvertently stepped on the lift control, lowering the boom, or the boom may have descended as a result of the leaking hydraulic fluid. Adequate protection from the hazards created by moving mechanisms requires measures beyond an individual worker's ability to remain clear of the nip points.

Recommendation #3: Employers should implement inspection programs to ensure that mobile equipment is maintained free of defects which affect safe operation.

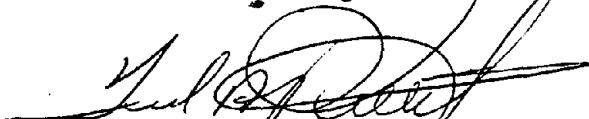
Discussion: The machine involved in this incident had been borrowed from a former business associate of the employer. After the incident, the left main pivot pin connecting the lower boom link to the frame of the machine could not be accounted for. It is possible that this pin may have backed out of the connection during operation and allowed the base of the lift arm to raise out of the joint. This would pinch the bucket cylinder hydraulic line against the boom cylinder and cause a leak. According to statements of the rescue personnel, the left main pivot pin was noted as missing when they evaluated the scene to determine the plan of extraction. The witnesses indicated that the machine had been operated successfully for several hours prior to the incident but may have arrived on site with a make-shift main pivot pin keeper. It would be unlikely that a missing main pivot pin could go unnoticed during operation as the motion of the boom arms would become skewed and out-of-balance toward the right side of the machine during operation. However, if the pin had disengaged while the boom was down in the carry position, the missing pin would not be apparent to the operator until the boom was raised. Raising the boom would also uncover the cut in the hydraulic line, increasing the rate of leakage. This raises the possibility that the pin fell out during the victim's trip just prior to the incident and could not have been detected until he raised the boom.



Paul H. Moore
Safety Engineer
Trauma Investigations Section
Surveillance and Field
Investigations Branch
Division of Safety Research



Virgil J. Casini
Project Officer
Trauma Investigations Section
Surveillance and Field
Investigations Branch
Division of Safety Research



Ted A. Pettit, M.S., R.E.H.S.
Chief
Trauma Investigations Section
Surveillance and Field
Investigations Branch
Division of Safety Research



Thomas K. Hodous M.D.
Acting Chief
Surveillance and Field
Investigations Branch
Division of Safety Research

Fatality Assessment and Control Evaluation (FACE) Project

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatality Assessment and Control Evaluation (FACE) investigations when a participating State reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying the working 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.

States participating in this study: North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia.

Additional information regarding this report is available from:

Division of Safety Research
National Institute for Occupational
Safety and Health (NIOSH)
1095 Willowdale Road
Morgantown, West Virginia 26505-2888
Phone: (304) 285-5916
FACE 97-20