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TO: CDR Louis Smith, NIOSH, Division of Safety Research

**FROM: Gary Bledsoe, Manager
Occupational Injury Prevention Program**

SUBJECT: Carpenter Dies After 12 Foot Fall From Ladder -- Alaska

SUMMARY

On September 14, 1993, a 33-year-old, male carpenter (victim) was killed as a result of traumatic head injuries sustained during an approximate 12-foot fall from a ladder. The victim was applying sheetrock mud to a wall/ceiling joint in the woodshop classroom of a vocational-technical school. The victim apparently lost his balance and fell from a ladder to the concrete floor, a distance of 11.5 - 12.5 feet. He apparently landed on his back and head, sustaining a head injury. Although the fall was not directly observed, a co-worker heard the victim hit the floor and found him lying unconscious near the ladder. Emergency medical personnel arrived three minutes later, and observed the victim sitting up. He appeared to be disoriented and combative. He had no obvious external head injury, other than a bump on the back of the head, but he was beginning to develop a black eye. He was restrained by EMS personnel, placed on a backboard, and had a cervical collar applied. He was then transported to the local emergency room. During the trip to the hospital (approximately five minutes) the victim developed seizures, and lost consciousness. The emergency medical technicians also noted the presence of bloody sputum coming from his mouth. He then developed respiratory distress, which progressed to respiratory arrest. The EMT's initiated CPR in route to the hospital. The victim's condition continued to deteriorate after admission to the hospital. He died approximately 3 hours later.

Based on the findings of the epidemiologic investigation, to prevent similar occurrences employers should:

- develop and institute a hazard communications program.
- conduct a general hazard assessment prior to beginning any job or work task.
- consider the use of mobile scaffolding or other types of work platforms, instead of ladders.
- ensure that work materials and tools are properly used; and
- appropriate officials should ensure that victims of traumatic occupational fatalities receive an autopsy to determine the specific pathophysiologic circumstances of the death.

INTRODUCTION

On September 14, 1993, a 33-year-old male carpenter died after falling approximately 12 feet from a fiberglass extension ladder to the concrete floor of a vocational-technical school shop class. The worker had been applying sheetrock mud to one of the shop's walls. The Alaska Division of Public Health, Section of Epidemiology was notified via the news media on September 17, 1993. An investigation, involving an Injury Prevention Specialist from the Alaska Department of Health and Social Services, Division of Public Health, Section of Epidemiology, ensued on September 21, 1993.

The incident was reviewed with the Alaska Department of Labor officials (AKDOL), witnesses, company officials, hospital personnel, and city fire/rescue officials. The site was visited, measurements were made, and photographs of the fatality site and relevant work materials were obtained. Appropriate documents (AKDOL reports, police reports, etc.) were obtained during the investigation.

The employee was a carpenter working for the local school district. He had worked for the school district, mostly during the spring and summer months, for two years. He worked full-time (37.5 hours per week) during these periods, and had worked a total of 7 months during 1992-1993. He worked at a number of different schools in the district, and had worked three days at the school where the incident occurred. The maintenance supervisor indicated that informal safety meetings were held, but there was no formalized hazard communications program. He also indicated that a foreman had meetings with the workers at the incident site, and monitored their conduct related to safety.

INVESTIGATION

A carpenter was "mudding" the interface of the ceiling and a wall at a vocational-technical school shop classroom. He was using a 24-foot fiberglass extension ladder to access the work area, and was up an estimated 11.5 - 12.5 feet (based on measurement of his approximate position on the ladder). Photographs taken on the day of the incident show that the ladder was leaning against the shop wall, but was turned around so that the rungs were not properly positioned. He had placed his mud tray on a Heating, Ventilation, Air Conditioning (HVAC) duct, which was hanging from the ceiling by metal strapping and ceiling anchors. The tray seemed to be within his reach based on the positions of the ladder and duct work in photographs. Another worker was located at the base of the ladder to stabilize it. At 3:43 PM the worker at the base of the ladder heard the victim fall. However, he was not looking up at the time, and was unable to describe exactly how the victim fell. A teacher (approximately 40 feet away in his office) heard a scream and the sound of someone falling. Both individuals found the victim lying on his back and unconscious. They observed that the HVAC duct work had been pulled from its anchorage, and was partially hanging down from its

normal position. They believed that the victim had fallen backwards based on his position and distance from the ladder. One of the workers called 911, and the emergency medical technicians arrived three minutes later. They found the victim conscious and sitting up. He was disoriented and combative. He persistently attempted to get up, saying that he had to go to the bathroom. The EMT's were able to restrain the victim and get him to lie down. They did not notice any significant external trauma to the head or back. However, they did notice a bump on the back of the victim's head. The victim was also developing a hematoma over the right eye, and decorticate posturing (stereotyped flexor arm movement indicative of midbrain damage). At this point the EMT's placed the victim on a back board and immobilized his neck with a cervical collar. He was taken to the ambulance and transport to the hospital was initiated nine minutes after initial arrival. During this trip he began to have seizures and became unconscious. He also started to suffer respiratory distress. By the time they reached the hospital (approximately four minutes), he was in respiratory arrest. He was admitted to the hospital, where his condition continued to deteriorate. He died approximately three hours later.

CAUSE OF DEATH

The victim's death was attributed to "cardiac arrest due to head injury with probable hemorrhage." An autopsy was not performed.

RECOMMENDATIONS/DISCUSSION

Recommendation #1:Employers should develop and institute a hazard communications program.

Discussion: The school district did not have a formalized hazard communications program. Informal safety meetings were conducted, but not regularly scheduled. A hazard communications program provides a mechanism to inform employees of potential hazards related to physical and chemical energies. Less obvious hazards, such as falls from relatively low heights, can be addressed under this type of program.

Recommendation #2:Employers should conduct a general hazard assessment prior to beginning any job or work task.

Discussion: Prior to beginning any job or work task, the work site should be evaluated for potential hazards. In this incident, such an evaluation may have revealed a number of potential problems: 1)

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the placement of the mud tray on a relatively unstable surface, 2) the work task's requirement for reaching, and 3) the reversed position of the ladder. These are further discussed in the recommendations below. This activity could be incorporated within a general safety program that includes work task hazard assessments, a hazard communications program, regular safety training and meetings, and assignment of collateral safety duties to an individual with the authority and knowledge to effectively carry out these responsibilities.

Recommendation #3:Employers should consider the use of mobile scaffolding or other types of work platforms, instead of ladders.

Discussion: The use of a ladder inherently limited the possible work area of the victim to an arm's length on either side of the ladder. In addition, the worker had to carefully maintain his position on the ladder through balance and holding on with one hand. The victim used a strap-mounted HVAC duct to place his mud tray on while "mudding" the ceiling/wall interface. Although this area seemed to be well within his reach, it is possible that he lost his balance by attempting to exceed a safe reach, or by lateral movement of the HVAC duct. Another possibility is that downward pressure on the HVAC duct caused the ceiling anchor points to fail. After the incident, the HVAC duct was found to be partially hanging from the ceiling. A larger work area, more stable work platform, and reduced physical stress could be gained through the use of mobile scaffolding or other types of work platforms. A number of mobile scaffolds are small enough to be easily fitted within average sized rooms. This would enable a worker to walk small distances safely, and reduce the need for re-positioning a ladder to access a new work area during operations, such as painting or "mudding." Since a worker can stand fully upright, and use both hands for work procedures, an additional safety factor is obtained with this equipment. Also, a larger work surface is available for the safer storage or positioning of tools and materials (e.g., "mudding" tray).

Recommendation #4:Employers should ensure that work materials and tools are properly used.

Discussion: Photographs taken immediately after the incident revealed that the position of the ladder was reversed. This caused the rungs to be at an unusual angle. Rungs in this position place more pressure on the feet, and can lead to more foot stress, discomfort, and reduced stability (the rungs are angled slightly downward in the reversed position). Although no evidence exists that this was a factor in the fatality, it is strongly recommended that tools and materials be properly used. An increased safety factor can generally be obtained through correct positioning of tools, work surfaces, and materials.

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Recommendation #5: Appropriate officials should ensure that victims of traumatic occupational fatalities receive an autopsy to determine the specific pathophysiologic circumstances of the death.

Discussion: An autopsy was not conducted on the victim. This resulted in a lost opportunity to obtain specific medical information regarding the pathophysiologic circumstances of the victim's death. Such information can be invaluable in fully understanding the mechanisms of traumatic deaths under certain work situations, design of work procedure-specific personal protective equipment, and improved knowledge of injury science.

References

1. Occupational Safety and Health Standards, Construction Code, Volumes I and III. Sections 01.02 and 01.11. Alaska Department of Labor, Division of Labor Standards and Safety, 1992.