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FACE 97-AK-023

To: **Ted Pettit, NIOSH, Division of Safety Research**

From: **Deborah Choromanski**
Occupational Injury Prevention Program

Subject: **Logger killed while felling tree -- Alaska**

SUMMARY

A logger was killed when the trunk of the tree he was felling (cutting) struck his head. The victim was part of a two-man crew cutting trees separately on a steep hillside. After clearing an intended fall area and an escape route of brush and saplings, the victim made a series of standard cuts to fell the tree. The tree twisted on its stump, causing it to fall differently than the intended position and to strike the side of an uphill stump. The tree rebounded and struck the victim as the butt of the trunk descended and swung toward him as it continued to slip to the side of the stump. His cutting partner (the witness) notified an emergency medical technician who administered CPR. The victim remained unresponsive and was pronounced dead at the scene.

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

- ensure that all cutters examine the tree before making a cut and inspect the chainsaw shavings or the wood wedge from the undercut for any signs of rot which could influence the tree's fall when finishing the cut;
- re-enforce the use of wedges to help control the fall of the tree;
- consider eliminating the use of a "swing cut" when defective timber is present and an adequate distance for the escape route is unavailable.

INTRODUCTION

At approximately 10:10 AM on July 6, 1997, a 59 year old male logger (the victim) was fatally struck by the trunk of a tree he was felling when it inadvertently landed on another stump. On July 7, 1997, Alaska Department of Labor (AK-DOL) notified the Alaska Division of Public Health, Section of Epidemiology. An investigation involving an Injury Prevention Specialist for the Alaska Department of Health and Social Services, Section of Epidemiology ensued on July 8, 1997. The incident was reviewed with AK-DOL officials. Alaska State Troopers and Medical Examiner reports, as well as AK-DOL reports, were requested.

The operation in this incident was a privately owned logging company that had been in operation since 1954. The company currently had 33 employees of which five were cutters. The victim had been previously employed by the company as a cutter for two consecutive seasons or approximately 20 months. This was his third season, and he had been cutting for 10 weeks.

The company had a written safety program, and safety meetings were held every two weeks.

All employees were required to complete a questionnaire accounting previous logging employment and activities and to provide documentation of current CPR training. Upon initial hire, employees were oriented with camp and general work and safety rules and assessed for individual skills and knowledge by the cutting supervisor or “bullbuck”.

The company had experienced only one injury during the previous and current season. This was the first fatality for the company.

INVESTIGATION

The incident occurred at a site 5 miles from the logging camp. The logging operation transported workers to various work sites via a network of unpaved roads. Each vehicle was equipped with a two-way radio.

The primary type of harvesting undertaken by the logging operation was clearcut. The terrain of the harvest area varied in slope, altitude, and ground conditions. The incident site was on a 70◦ to 80◦ slope and less than 2,500 feet in altitude. The ground conditions consisted of moderate to heavy brush. Forest composition was mixed hardwood and conifer. The felled tree in this incident was spruce, approximately 50 feet in height with a stump diameter of 16 inches. Spruce bark beetle infestation in the local timber was noted but was not a factor in this incident. Weather was not a factor in this incident.

The victim and his cutting partner (the witness) were assigned a strip of naturally occurring timber. Previous to this day, the cutters were “doublejacking” or working together due to terrain, timber, and/or other environmental conditions. On the day of the incident after the bullbuck completed the site survey, the bullbuck allowed the cutters to work separately while maintaining voice and visual contact.

At the time of the incident, the victim and the witness were working approximately 200 feet apart but were separated by a steep gully with vertical and near-vertical exposures of several hundred feet. They had been on duty for two hours and had already cut several trees in the area. After examining the tree and the terrain, the victim cleared a “lay”, an area on the ground where the tree would fall, of saplings and other trees that were potential hazards when the tree fell. Relative to the tree, the lay was located approximately 15 feet directly upslope and approximately 20◦ to the left of a moss-covered stump (Figure 1). The stump appeared to be the only ground obstacle near the lay. An 8- to 10-foot escape route was also cleared in a direction nearly opposite the

lay. Since the escape route led toward a precipice above the gully separating the two workers, its distance from the tree to be felled was limited. It was surmised that another stump upslope from the escape route could have also provided some protection if necessary.

The lean of the tree (or its angle with respect to true vertical) was not known. However, a conventional undercut or notch cut (Figure 2) to guide the tree in falling was made approximately 45◦ counterclockwise from the direction of the intended lay (Figure 1b). The wedge of wood from this first step of the felling process was not found at the scene. A backcut was made on the opposite side of the tree. Examination of the stump indicated the backcut was level, approximately 2 inches above the top of the undercut, and was slightly deeper on the downhill side. This technique left a triangular-shaped piece of uncut or holding wood approximately 2 inches thick at its widest end (Figure 3). The tree fell approximately 45◦ clockwise from the direction of the intended lay, nearly 90◦ from the direction of the undercut. This caused the trunk to strike the right-side of the moss-covered stump. The stump and adjacent saddle area acted as a pivot, causing the butt of the trunk to rebound. It is surmised the victim was struck as the butt descended and swung toward him as it continued to slip to the side of the stump.

The witness, having maintained intermittent contact throughout the morning with the victim, estimated a 5 to 10 minute period lapsed since he had last seen the victim. Although a company safety policy required cutters to stop their chain saw motors when not in use, the witness could still hear the victim's chain saw idling. Upon his arrival to the scene, the witness found the victim approximately 4 feet from the stump, seated with his head bent over his legs and his back to the newly fallen log. The left-side brim of the victim's hard hat was bent upward indicating a strong blow to the head. No pulse or signs of breathing were apparent. The witness continued across the ridge to notify the emergency medical technician (EMT) working near the incident site. The EMT notified the logging camp supervisor and returned to the scene with the witness

approximately 10 minutes after the witness found the victim. CPR was administered. The victim remained unresponsive and was declared dead at the scene.

CAUSE OF DEATH

The medical examiner's report listed the cause of death as blunt impact to the head from a falling tree.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that all cutters examine the tree before making a cut and inspect the chainsaw shavings or the wood wedge from the undercut for any signs of rot which could influence the tree's fall when finishing the cut.

Discussion: Examination of the scene indicated that the victim practiced safe felling technique -- 1) the lay was on the opposite side of the obstacle away from the gully, providing an area where the log could be safely bucked (or limbed and sawed into sections); 2) the lay and escape route were cleared of trees and brush which could hinder the fall of the tree or the escape of the cutter; and 3) a clean, uniform undercut and level backcut were completed. However, the undercut penetrated an approximate 3x10 inch area of heart rot (Figure 3). Although heart rot is more common in older trees with larger diameters, this type of rot can occur in smaller trees. Heart rot is usually caused by damage or injury to the trunk at an earlier stage of growth. The core can continue to degrade while the external wood heals. This seriously compromises the holding wood which was to act as a hinge to help control the tree's fall. Examination of the wedge or shavings from the undercut may have shown signs of discoloration or rot and indicated the wood within the core was substantially weaker than the peripheral wood of the trunk.

Recommendation #2: Employers should re-enforce the use of wedges to help control the fall of the tree.

Discussion: The use of metal or plastic wedges can reduce the risk of the tree pulling away from its intended direction of fall. Although the lean of the tree in this incident was unknown, the difference in the directions of the intended lay and the undercut indicated the victim planned to "swing" the tree, that is, have it fall in a direction other than the undercut. A technique used to help maintain control during the felling process is to place one or more wedges in the backcut to help force the tree into the lay. Wedges support the tree as the backcut is finished to prevent the tree from falling towards the backcut and help to push the tree towards the intended lay. Once in place and the chainsaw bar is removed, the wedge is driven further into the backcut. While wedging slows the felling process, this method is highly recommended to help control the tree as it falls especially for trees with defective wood.

Recommendation #3: Employers should consider eliminating the use a "swing cut" when defective timber is present and an adequate distance for the escape route is limited.

Discussion: A conventional cut provides a clean, uniform undercut and a level backcut leaving a symmetrical band of holding wood to control the direction of fall by preventing the tree from prematurely slipping and twisting from the stump. A healthy tree without a heavy lean can be pulled or swung 45◦ or greater to either side of its lean by leaving a triangular-shaped strip of holding wood in place. This type of cut or "swing cut" places a heavy burden on the cutter's judgment and experience. It also necessitates the cutter to stay with the tree for a longer period, thereby increasing his risk of injury.

Defective timber present an increased risk of loss of control during felling. In this incident, heart rot was noticeable in the undercut. The safest means to fell defective timber is to fell the trees into their natural lean. Employers should consider eliminating the use of the swing cut particularly in stands exhibiting defective timber. Although

spruce bark beetle infestation was not a factor in this incident, it may indicate potentially defective timber in stands of trees with smaller diameters. Usually infestation occurs in older trees, damaging the peripheral wood and leaving the core wood intact. However, younger, unhealthy trees are more susceptable and can exhibit signs of early infestation.

In addition, cutters need to exercise more caution when felling defective timber. In this incident, the victim's intended escape route was limited by the terrain. If a tree cannot be safely felled due to defect and/or terrain, presenting an unacceptable risk to the cutter, the tree either should not be felled or, if doubt of maintaining control exists, be marked for an explosive charge.

References

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