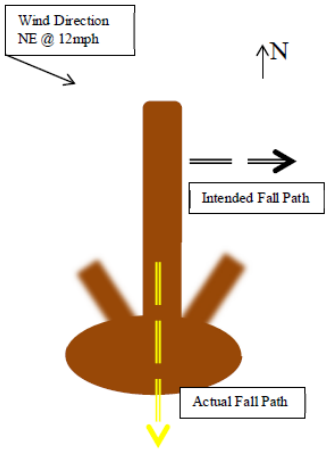
MIFACE Investigation Report #11MI005

Subject: Logger Killed by Falling Tree

Summary

In the winter of 2011, a male logger in his 50s died when he was struck by a falling hardwood tree approximately 75 feet tall and 20 inches in diameter at its base. A branched section existed approximately 50 feet up the tree. The decedent and a coworker were hand felling a clump of three hardwood trees (trees with a common base) that could not be felled by mechanical means using the firm's processor. The incident tree was the last tree of the clump to be felled. A coworker (Coworker 1) was nearby operating a skidder. The terrain was snow covered and the tops from other trees felled previously by mechanical means were present. The decedent's coworker (Coworker 2) cut and completed the notch on the east side of the tree. Coworker 2 noted the locations of the skidder operator and the decedent before beginning the back cut. He noted that the decedent was standing behind him on the north side of the tree. He completed the back cut, intending for the tree to fall to the east. As the tree began to fall it twisted on the stump and began to fall to the south. Coworker 2 looked up and observed the decedent to the south and in the direction of the falling tree. Coworker 2 yelled to the decedent to "look out", and the decedent began to run to get out of the way, but ran toward and into the path of the falling tree. Coworker 1 attempted to drive the skidder under the falling tree to keep it from striking the decedent. The decedent was located approximately 50 feet from the base of the tree when he was struck on his back and head by one of the branched sections as he dove toward a nearby tree top to get out of the way. The decedent was not wearing head protection. Coworker 2 used the decedent's chainsaw to cut the tree away from him while the skidder operator used his cell phone to call for emergency response and notify the crew leader. Coworkers immediately began first aid while emergency response was en-route. The decedent was declared dead at the scene.



Drawing 1. Diagram of tree clump. Intended direction and actual fall of tree

Contributing Factors

- Working within two tree lengths of tree during felling operations
- Improper tree assessment and felling techniques
- Lack of supervisory authority to enforce safety policies
- Failure to establish, clear, and maintain an escape route prior to felling trees

RECOMMENDATIONS

- Employers should instruct each employee and enforce the safe work practice that no workers, with the exception of the tree feller, should be closer than twice the height of the tallest tree being cut.
- Fellers should assess a tree's condition prior to felling the tree and use proper felling techniques.
- Workers on a logging site should wear appropriate personal protective equipment.
- Employers should develop a written company safety program which includes, but is not limited to, development of safe work procedures and worker training in hazard identification, avoidance and abatement. The employer should ensure the program is consistently implemented and enforced including methods for dealing with worker non-compliance.

BACKGROUND

In the winter of 2011, a male logger in his 50s died when he was struck by a 75-foot tall hardwood tree. MIFACE was informed of the incident by the MIOSHA 24-hour hotline report. The MIFACE investigator interviewed one of the two firm owners. The MIOSHA investigation file, death certificate, Sheriff and Medical Examiner reports were reviewed during the writing of this report. Incident scene pictures used in Figures 1, 3, 4 are courtesy of the MIOSHA investigating officer, and the incident scene picture used in Figure 2 is courtesy of the responding sheriff department.

The employer was a commercial logging company that specialized in both saw timber and pulpwood logging. The company had been in operation for four years, but the owners had been working together for 28 years. The owners had 20 years of logging experience. The firm employed 10 individuals, eight of whom, including the decedent, had the job title of "cutter". The decedent was a full-time, hourly employee. He had been employed by the company for six months but had 30 years of logging experience. The decedent had his own logging business prior to joining the firm.

Private individuals and commercial clients would contact the company informing them that they had wood to sell. One of the owners would inspect the wood stand and offer a price per cord. The price for this job included cutting logs into 10-foot lengths.

The firm did not have a written safety program but was a member of the Michigan Association of Timbermen (MAT), a non-profit trade association, and the Michigan Association of Timbermen Self-Insurers' Fund (MATSIF). MATSIF training topics entitled "Think Safety" were used for employee training. The firm had each employee sign a card certifying that "I have

participated in my employer's monthly safety training and I have not had any injury during the Month of ….". The decedent had signed the cards for the months of November 2010 (trained on Hearing Conservation), December 2010 (Personal Protective Equipment – Logging), and January 2011 (Slips Trips and Falls). The firm was aware of the requirements of MIOSHA Safety Standard, Part 51 – Logging Operations.

The employer provided and required the use of personal protective equipment, including hard hats, safety boots, gloves, chaps, and eye protection for loggers at the logging site, but routinely did not enforce this requirement. Hearing protection was not required.

Employer Remediation

After the fatal incident, the company took the following actions to ensure a similar incident would not occur:

1. NEW Work Rules:
    a. All employees are walked through job before starting so they can be familiar with it and are watched by the crew boss.
    b. Employees must do the work the way trained to do it or be dismissed – no exceptions.
    c. The safety foremen, who in the past, did not have the authority to enforce safety rules, has been given the authority to enforce all personal protective equipment (PPE) requirements for inspecting equipment. The foreman has the authority to send employees home or to the office to obtain required PPE before coming back to work. The employee is given a written warning if required PPE is not brought to worksite and worn. The employee is terminated with a repeat instance.
    d. If a person has a major event going on in their personal life (for instance, court, funeral, health issues, etc), they are to take the whole day off, not just part of it – attention needs to be on the job, not elsewhere, because of the dangers of the job.

2. The day after the incident, all employees were present at a meeting and were told that they will be terminated if, during felling operations, they work within two tree lengths of each other.

3. Each new employee is trained in safety procedures by the owner and the crew boss. The firm covers the practice of communication and cell phones on the job, the habit and rules of clean landings, the proper use and maintenance of equipment and the authority of the crew boss. The firm uses MAT and MATSIF training materials to develop the rules and guidelines.

4. Firm's employees have subsequently participated in MATSIF's Course, Mechanical Logging Training, that covers

- Job site evaluation (including review of MIOSHA Logging Standard Part 51)
- Equipment check
- Machine startup
- Machine lubrication

5. Provided ear plugs and made wearing steel toe boots mandatory.

6. During mandatory attendance at monthly safety meetings held at the company office by both company owners, MATSIF training topics and company work rules and guidelines are reviewed.

7. Scheduled CPR and first aid refresher training.

8. Eliminated hand cutting crews. Only one employee is authorized to hand fell a tree with a chain saw. This employee has had extensive training on proper felling techniques.

9. Contact board hung in office listing who is working with who in the field, the crew location, and the phone numbers of all workers.

MIOSHA General Industry Safety Division compliance officer issued the following Serious citation to the firm at the conclusion of its investigation:

Serious: LOGGING, PART 51

- RULE 5122: A protective helmet was not provided to each employee at no cost to the employee and its use was not assured:

  (Employee not wearing protective helmet while hand felling trees – Logging Operations)

- RULE 5119(3)(a)-(f): Ensure that at a minimum, training shall consist of all of the following elements:

  (a) The safe performance of assigned work tasks.
  (b) The safe use, operation, and maintenance of tools, machines, and vehicles that the employee uses or operates, including an emphasis on understanding and following the manufacturer's operating and maintenance instructions, warnings, and precautions.
  (c) The recognition of safety and health hazards associated with the employee's specific work tasks, including the use of measures and work practices to prevent or control the hazards.
  (d) The recognition, prevention, and control of other safety and health hazards in the logging industry.
  (e) The procedures, practices, and requirements of the employer's worksite.
  (f) The requirements of these rules.

(Employee not trained in the requirements of MIOSHA Part 51, Logging standard – Logging Operations)

- RULE 5151(1): Ensure that an employee, except the faller, shall not be closer to a manual or mechanical felling operation than twice the height of the tallest tree being cut.

  (Employee within 50 feet of another employee felling a group of trees – Logging Operations)

INVESTIGATION

The clear cut operation occurred on a 37-acre private parcel consisting of aspen and hardwood trees. The site conditions were characterized by moderate to heavy brush and snow-covered uneven, flat terrain. Wind speeds were 12-15 mph and the temperature was 16^0F.

Figure 1. View of incident site, looking south standing at stump

The work crew drove their private vehicles to the work site. The foreman's truck contained the site's first aid kit. The crew had been working at this site for several days. Prior to beginning work on the site, the crew discussed the pattern of cutting and how to conduct the trimming. The clear cut operation was on schedule.

The mechanical harvester had been at the site for three days and the hand cutters had been on site for two days. The mechanical harvester had cut the smaller wood so the area was full of brush, but fairly open. On the day of the incident, three of the four crew members arrived at the site at approximately 8:00 a.m.; the decedent arrived later because he had some personal issues to resolve.

Figure 2. Incident site looking north. Standing at location of where decedent was struck.

The work crew included a mechanical harvester, a skidder operator and two cutters. The crew leader was a family member of the owners and trained in first aid/CPR. He operated the mechanical harvester to the east of the incident site on the opposite side of the parcel.

The skidder operator (Coworker 1) and the other cutter (Coworker 2) proceeded to the west side of the parcel and began operations to begin cutting and skidding felled tree clumps which had not been cut by the mechanical harvester.

The decedent arrived after 11:00 a.m. He used his own newly bought chain saw to fell and limb trees.

The hardwood tree involved in the incident was the last of a clump of three trees (trees with a common base). The tree was approximately 75 feet tall and 20 inches in diameter at its base. There was a branched section approximately 50 feet up the tree. The tops from other trees felled previously by mechanical means were present to the south of the tree. An adequate escape path for the intended fall direction had been prepared.

The decedent and Coworker 2 hand felled the clump. The first tree fell without incident. The second tree lodged in a nearby tree. Coworker 2 asked the skidder operator to pull the lodged tree out while the decedent and Coworker 2 took a work break. After the lodged tree was removed, Coworker 2 began to take down the remaining tree (incident tree) of the clump.

Figure 3. Close up of incident tree stump, looking north

Coworker 2 cut and completed the notch on the east side of the incident tree. Coworker 2 noted the locations of the skidder operator and the decedent before beginning the back cut; the decedent was standing behind him, approximately 25 feet away. Per Coworker 2's statement to the police, he stopped part of the way through the back cut to make sure the area was clear. Coworker 2 stated that the decedent came up to about 10 feet behind him. Coworker 2's work practice was to give a verbal warning prior to completing the back cut. Due to the location of the decedent, it is unknown if a verbal warning was given. Coworker 2 completed the back cut, intending for the tree to fall to the east. As the tree began to fall, it twisted on the stump and fell to the south. Coworker 2 looked up and observed the decedent to the south and in the direction of the falling tree.

Figure 4. Notch and back cut on stump

Coworker 2 yelled to the decedent to "look out". The decedent ran to get out of the way, but ran toward and into the path of the falling tree. The skidder operated by Coworker 1 was positioned west of the decedent and Coworker 2. Coworker 1, seeing the position of the decedent and the falling tree, attempted to drive the skidder under the falling tree to keep it from striking the decedent. The top of the tree hit the cab of the skidder. The decedent was located approximately 50 feet from the base of the

tree when he was struck in his back and head by one of the branched sections as he was diving to a nearby tree top to get out of the way. The decedent was not wearing head protection.

While Coworker 2 used the decedent's chainsaw to remove the tree branches, Coworker 1 notified emergency response via his cell phone. Coworker 1 also notified the crew leader who rushed to the scene. The decedent's coworkers administered first aid while emergency response was en-route. The decedent was declared dead at the scene.

Both owners arrived at the scene after receiving a phone call from the crew leader.

CAUSE OF DEATH

The cause of death as listed on the death certificate was craniocerebral trauma. Toxicological results were negative for alcohol, illegal, and prescription drugs.

RECOMMENDATIONS/DISCUSSION

- Employers should instruct each employee and enforce the safe work practice that no workers, with the exception of the feller, should be closer than twice the height of the tallest tree being cut.

MIOSHA General Industry Safety Standard, Part 51, Logging Rule 5151 requires that "an employee, except the faller, shall not be closer to a manual or mechanical felling operation than twice the height of the tallest tree being cut." Training for *fellers* should include ensuring that no other person, machine, or other operations is/are within two tree lengths of the tree being felled. Training for *all workers* at the site should include that no person should be closer than two tree lengths to a tree being felled unless that individual is assisting with felling, training others or being trained. Training should also address Rule 5116 (4), which states that employees shall refrain from a reckless practice or action which could result in an accident or injury. If the decedent had been positioned outside of the two times the height of the tree requirement, this incident may have been avoided.

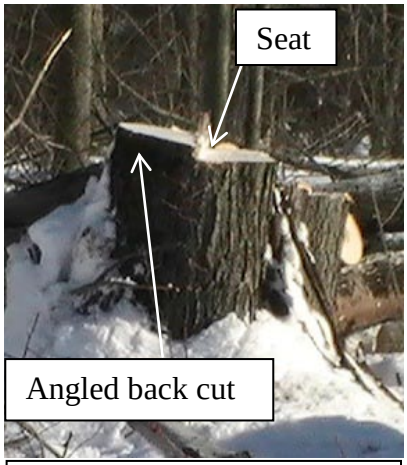


Figure 5. Close-up view of stump showing seat in notch cut and angled back cut

- Fellers should assess a tree's condition prior to felling the tree and use proper felling techniques.

It is unknown if the feller assessed whether there was existing tree damage or if the tree was weakened on the side of the trunk where it may have contacted the other tree growing in the clump. Also unknown is the incident tree's canopy distribution, which could have affected the fall direction.

The faller did not utilize the appropriate felling techniques and did not adhere to consensus or regulatory requirements when

making his notch (undercut) and back cut. A proper notch and back cut directs the tree's fall and the hinge wood (holding wood) keeps the tree under control and in its directed fall path.

The conventional notch was cut at a slight angle, was deeper than 1/3 of the tree diameter, and had a “seat” which did not leave appropriate hinge wood to guide the tree’s fall and may have interfered with the smooth closing of the notch. The top cut angle of the notch is unknown.

The back cut was too deep, and although it appeared to be approximately two inches above the notch cut as required by Part 51. The back cut was not horizontal. The angled back cut increased the possibility of the hinge breaking early, resulting in the loss of felling control as well as a low quality butt. The cause of the tree rotation is unknown. Employers should periodically review the cuts used by the fellers to fell a tree to ensure fellers are utilizing the appropriate felling techniques.

- Workers on a logging site should wear appropriate personal protective equipment.

Considering the hazards to personal safety that tree felling operations may create, tree fellers should wear head, hand, leg, eye, face, and foot protection. If chainsaws are used, hearing protection should be worn. MIOSHA regulations for logging state that employers should provide employees with appropriate head protection and ensure that it is worn when the employee works in an area where there is potential for head injury from falling or flying objects. In this case, the employer had hard hats available for his employees and although he encouraged his employees to wear the hard hats, it was not enforced. The decedent did not wear a hard hat, and given the force of the blow he received, its use may not have affected the fatal outcome. Although it is not known for certain whether a hard hat would have prevented this fatal injury, the wearing and use of appropriate PPE should be required and its use enforced by employers to reduce the risk of injury and potentially save an employee’s life at the logging site.

Additionally, logging firms should require fellers use hearing protection while operating chain saws. At the operator’s ear, the sound pressure level of chain saws easily exceeds 100 dBA. The MIOSHA General Industry Health Standard, Part 380 Occupational Noise Exposure, Table 2 shows the noise levels to which an employee can be exposed.

- Employers should develop a written company safety program which includes, but is not limited to, development of safe work procedures and worker training in hazard identification, avoidance and abatement. The employer should ensure the program is consistently implemented and enforced, including methods for dealing with worker non-compliance.

Although the decedent had many years of logging experience, he may have become complacent in his awareness of potential hazards on the job site, such as a tree falling in an unintended direction and his positioning near the tree.

Part 51, Rule 5119 describes the elements of an employee training program. The employer assumed that the decedent had sufficient knowledge and did not provide the extensive training required under Rule 5119. The decedent had not received training on safety issues specific to this incident. The absence of training in the recognition of the hazards of assuming the tree will fall in the intended direction, not watching the tree fall direction, and turning ones' back on a falling tree contributed to this fatal incident. Ongoing health and safety meetings conducted at a minimum of one time per month are also required by Part 51.

The key elements for a written safety program should include, at a minimum, training in hazard identification and the avoidance and abatement of these hazards. In this incident, the decedent was not felling a tree at the time on the incident. Apparently, when hearing the "look out" warning, the decedent immediately started running away without first identifying the hazard. He ran directly into the path of the falling tree. When the situation and circumstances permit, workers should visually see what and where the hazard is before trying to escape it, especially when the most likely hazard is a falling tree.

Additionally, the program should address the steps to be taken in the event of identifying a worker who fails to follow company-established safe work practices. Part 51 Rule 5113 states that employers must provide supervision necessary to enforce compliance with these rules. Prior to the fatal incident, authority was not given to the crew leader to enforce the company-required and MIOSHA-required safe work practices, including the wearing of personal protective equipment. Company policy has been amended and now authority has been granted and a disciplinary procedure developed and enforced to ensure compliance.

REFERENCES

MIOSHA standards may be found at and downloaded from the MIOSHA, Michigan Department of Licensing and Regulatory Affairs (LARA) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available for a fee by writing to: Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling (517) 322-1845.

- MIOSHA General Industry Safety Standard, Part 51, Logging
- MIOSHA General Industry Health Standard, Part 380, Occupational Noise Exposure
- OSHA Logging E-tool. http://www.osha.gov/SLTC/etools/logging/manual.html
- Logger Killed While Freeing Maple Log With Chainsaw During Skidding Operation. MIFACE Investigation# 01MI039. http://www.oem.msu.edu/MiFace/01MI039v1.pdf
- Tree Feller Dies After Being Struck by Snag While Felling Tree in West Virginia. West Virgina FACE Investigation 99WV038. http://www.cdc.gov/niosh/face/stateface/wv/99wv038.html
- Logger Fatally Injured by Falling Limb. Kentucky FACE Investigation #98KY063. http://www.cdc.gov/niosh/face/stateface/ky/98ky063.html

- Logger Dies After Being Struck by Falling Tree. Missouri FACE Investigation #98MO023. http://www.cdc.gov/niosh/face/stateface/mo/98mo023.html
- Weather Underground. http://www.wunderground.com/

KEY WORDS: Struck by, falling tree, escape route, feller, Logging

 June 6, 2013