

FATALITY ASSESSMENT AND CONTROL EVALUATION

**A 23-Year-Old Worker Pulled into a Wood Chipper on His First Day on the Job
Case #: 16NY024**

INCIDENT HIGHLIGHTS

-  **DATE:**
May 4, 2016

-  **TIME:**
1:15 p.m.

-  **VICTIM:**
23-year-old worker of a tree service company

-  **INDUSTRY/NAICS CODE:**
Landscaping Services/561730

-  **EMPLOYER:**
Tree care and service

-  **SAFETY & TRAINING:**
No safety training

-  **SCENE:**
Private residence

-  **LOCATION:**
New York

-  **EVENT TYPE:**
Pulled-into a wood chipper

SUMMARY

On May 4, 2016, a 23-year-old laborer (victim) hired by a tree service contractor (employer) was pulled into a wood chipper (Bandit 250) on his first day on the job. At the time of the incident, the victim was doing ground work with two other workers and the employer at a residential site. There was no eyewitness to the incident. The victim was pulled head first into the wood chipper... [Read the report](#) (p.2)

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

- Inexperienced and untrained workers were assigned to feed chipper;
- Worker training on chipper hazards and safe feeding techniques were not provided;
- Safe feeding techniques were not followed;
- Workers were not required to wear proper clothing and PPE;
[Learn more](#) (p.7)

RECOMMENDATIONS

NY FACE investigators concluded that, to help prevent similar occurrences, employers should:

- Ensure that workers follow safe feeding techniques recommended by chipper manufacturers.
- Ensure that all employees receive proper and adequate training before assigning them to feed wood chippers.
- Ensure that workers wear proper clothing and personal protective equipment when operating/feeding wood chippers. [Learn more](#) (p.7)



SUMMARY

At 1:15 p.m. on May 4, 2016, a 23-year-old laborer (victim) hired by a tree service contractor (employer) was pulled into a wood chipper on his first day on the job. The victim, who had never done any tree work before, was hired by the employer to assist ground work at three residential job sites. All three jobs involved cutting down trees and chipping the cuttings with the wood chipper. At the first site, the employer demonstrated to the victim how to feed the branches into the chipper and how to turn the machine off. He also showed the victim how the feed control bar and the “last chance cables” worked. The employer instructed the victim not to feed the chipper when the feed wheels were engaged. However, he also told the victim that he could feed the chipper when the experienced workers were nearby or next to the machine. The work scene at the second job site was captured by a surveillance video camera on the property. The images showed that the victim was feeding the chipper when the feed wheels were engaged, leaning down and reaching into the chipper, and pushing small debris into the chipper with his hands. The incident occurred at the third job site. No one saw the instant when the victim was pulled into the chipper. The employer stated that he saw the victim right before the incident. The victim was standing by the chipper and “there was nothing to pick up and put in the chipper”. Less than a minute later, he heard the chipper making a “weird noise”. He turned and saw the victim’s feet sticking out of the chipper. The employer rushed to the chipper and turned it off before calling 911. The EMS and police arrived within minutes and the victim was pronounced dead at the scene. The wood chipper was examined by the manufacturer 12 days after the incident. The examination did not find any deficiency or malfunctioning parts on the chipper that might have contributed to the incident.

INTRODUCTION

At 1:15 p.m. on May 4, 2016, a 23-year-old laborer (victim) hired by a tree service contractor (employer) was pulled into a wood chipper on his first day on the job. The New York State Fatality Assessment and Control Evaluation (NY FACE) staff learned of the incident through news media and started an investigation. The employer initially agreed to work with NY FACE, but later stopped responding to phone calls. NY FACE continued its investigation without the participation of the employer. The Occupational Safety and Health Administration (OSHA) investigated the case and cited the employer for one willful and three serious violations with a penalty of \$141,811. The employer contested the OSHA citations and the case went to a formal hearing of the Occupational Safety & Health Review Commission. The NY FACE investigator attended a post-incident examination of the wood chipper, discussed the case with the investigating OSHA compliance officer, and attended the formal hearing. This report summarizes the findings. At the time when this report is written, the judge presiding over the formal hearing had not issued a decision.

EMPLOYER

The employer worked as a tree trimmer when he was 15 years old and started his own business more than 20 years ago. His primary business was tree service and he plowed snow in winter as a side business. He owned a Dingo loader, a bucket truck, a wood chipper, and three trucks. During the tree work season, he hired one to four workers to provide services ranging from tree trimming, topping, removing, grinding, and chipping to land clearing. The employer was not a member of a tree business association and he did not have workers’ compensation insurance at the time of the incident.

WRITTEN SAFETY PROGRAMS AND TRAINING

The employer did not have any written safety and health program, nor did he have a worker training program. Although he had never used the OSHA website to learn about the hazards associated with tree work and wood chippers, he was aware of wood chipper hazards. The employer received the operating manual and a safety training DVD when he purchased the chipper. The manual and DVD were not kept on the chipper at the time of the incident. None of his employees reviewed the manual, nor did they view the DVD.

The employer stated that he used the Dingo to load the tree cuttings into the wood chipper whenever possible so that he could keep workers away from the chipper and prevent injuries. He had never been inspected by OSHA during the 20 plus years that he was in business until this incident. This was the company’s first fatal incident.

WORKER INFORMATION

The victim had been a ward of the state and spent time in foster care while growing up. Both his birth mother and foster mother who adopted him passed away. He had been homeless for some time. He attended a community college and had worked as a dishwasher. In two weeks, he was to marry his fiancée who had three children. The victim, who had never done any tree work, was hired for a day of tree work by the employer for a payment of \$60.

MACHINERY INVOLVED IN THE INCIDENT

The wood chipper was a handfed disc style wood chipper (Model: Bandit 250, Photo 1) with cutting capacity up to 12 inches in diameter. The chipper consisted of a 110-HP diesel engine, a folding feed tray, a feed hopper, an automatic feed mechanism, a chipping disc, and a discharge chute. The main component of the automatic feed mechanism was a pair of hydraulic horizontal feed wheels located between the infeed hopper and the disc cutter. Tree materials were placed on the feed tray and fed into the hopper until they were caught by the rotating feed wheels. The feed wheels pulled the materials into the disc cutter at a speed of 2 feet per second. With a rotational speed between 1,000 and 2,000 rpm, the disc cutter cut and shredded the woody materials and propelled them through the discharge chute.

The Bandit 250 was equipped with two safety features to control the feed wheels: a feed control bar and two “last chance cables”. The feed control bar was mounted across the top and along the sides of the infeed chute (Photo 1). It had three positions: feed, neutral (off), and reverse feed. A worker could use the control bar to stop or reverse the rotation of the feed wheels during an emergency.

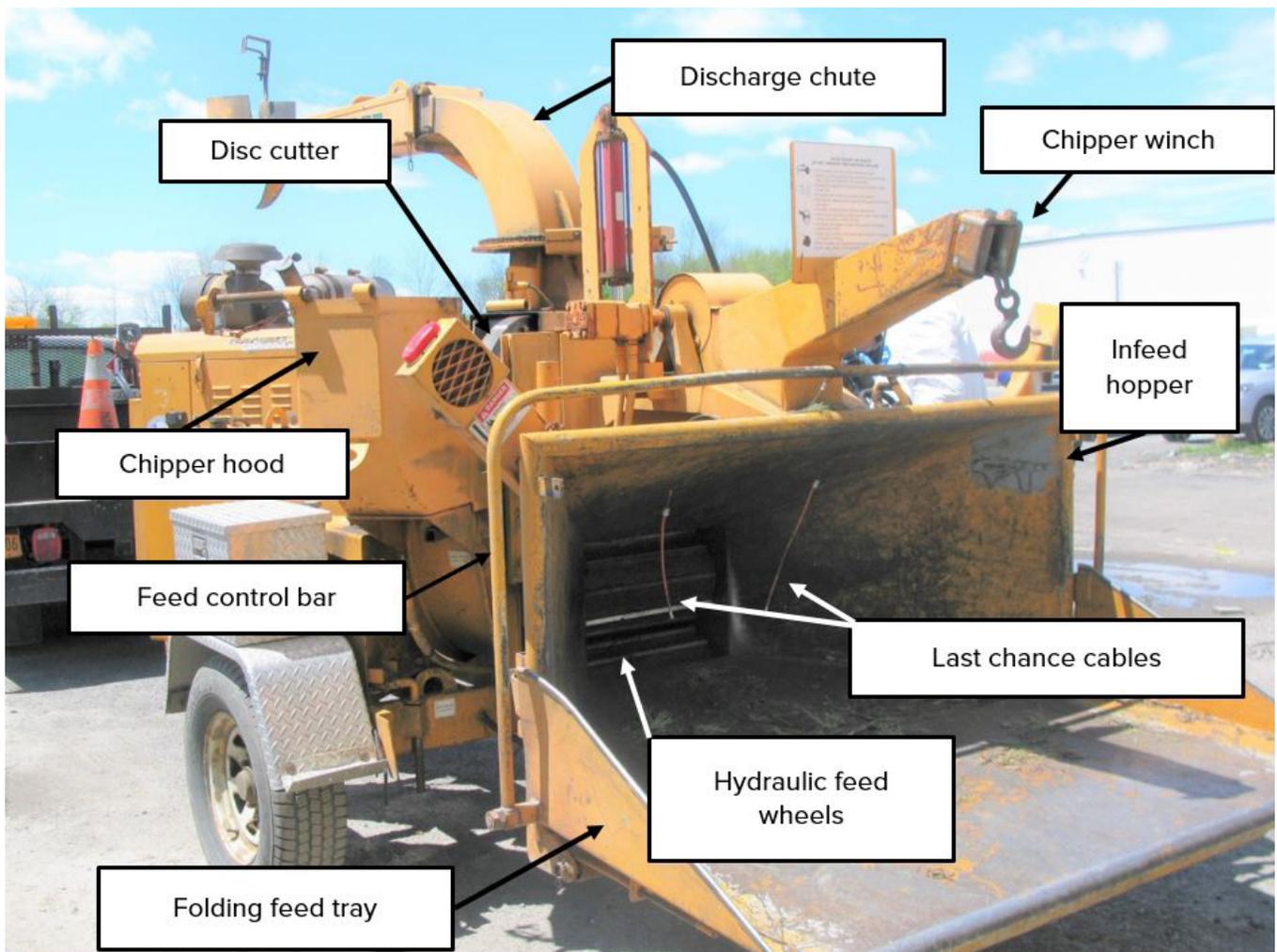


Photo 1. Bandit 250 Brush Chipper that was involved in the incident.

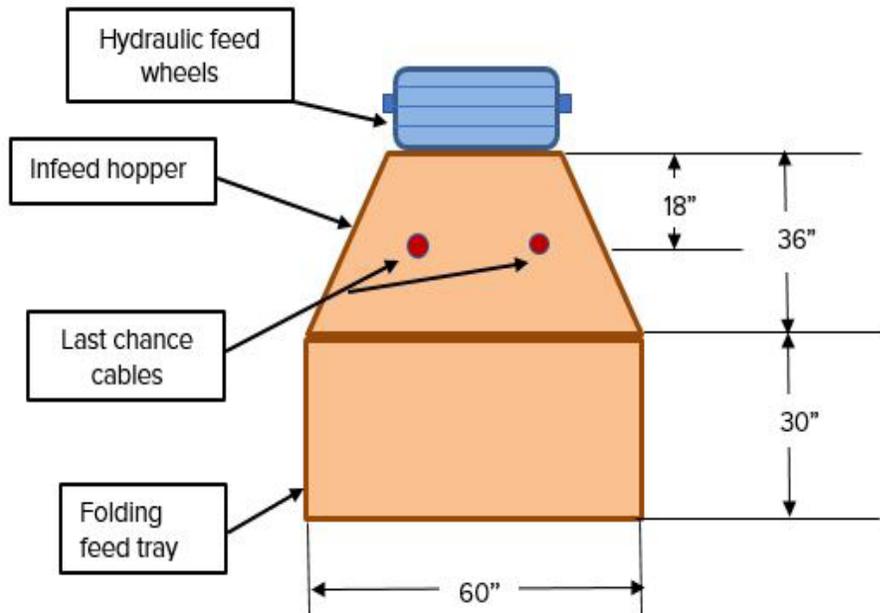


Figure 1. Location of the last chance cables on Bandit 250.

The “last chance cables” were located inside the infeed hopper and pulling them could reverse the feed wheels (Photo 1). The folding feed tray was 19 inches above ground, 30 inches deep, and 60 inches wide (Figure 1). The infeed hopper opening was approximately 36 inches long, 60 inches wide, and 36 inches deep. The last chance cables were 18 inches from the feed wheels.

If a worker fed the chipper from the end of the feed tray, the distance between the worker and the feed wheels would be 66 inches. Based on the chipper’s feed speed of 2 feet per second, the time for a worker to be pulled into the feed wheels was approximately 2.75 seconds. When the worker reached the last chance cables, he would have less than a second, 0.75 seconds to be precise, to pull the cables.

Workers can be caught by the feed wheels when reaching into the infeed hopper to hand feed small and short materials. Bandit provided a wooden push paddle to help feed small debris safely.

Additional safety features on the Bandit 250 chipper were a spring lock for the chipper hood pin and a chipper hood engine disable plug; both were to prevent workers from opening the chipper hood while the disc cutter was still rotating. The chipper hood covered the casing of the disc cutter. Workers could be struck by the hood when they opened the hood before the disc cutter came to a complete stop.

The employer purchased the chipper new in 2004 from a local dealer. At the time of the purchase he was asked by the dealer to sign a Warranty Validation Form. Dealers were supposed to provide all buyers with safety instructions on how to operate the equipment including specific safety precautions recommended by the manufacturer. A signed form attested that the dealer provided the instructions and the buyer understood the instructions. The employer stated that the dealer did not provide any safety instructions, even though both the dealer and the employer signed the form.

INVESTIGATION

The night before the incident

The employer was to do tree work at three residential sites the next day. All three jobs involved cutting down trees and chipping the trimmings and cuttings with the wood chipper. A crane contractor was hired to assist with the tree cutting and removal. The employer had two experienced regular seasonal employees, a tree trimmer and a ground worker. The tree trimmer had worked in tree business for ten years including nine months over a two-year period for the employer. The ground worker had worked for the employer for four years off and on and in one year, he worked nine months straight. Both the tree trimmer and the ground worker could operate a chain saw, the Dingo, and the wood chipper.

The employer needed extra helping hands for the three jobs and he hired two more workers through the tree trimmer and the ground worker. The victim was a friend of the ground worker who had asked the employer several times to give the victim work since he needed money. The employer knew that the victim had never

done any tree work. He agreed to hire the victim to help with the ground work.

The second person hired was the tree trimmer's friend (Worker I) who had worked for the tree contractor a few times before. During the few times he worked for the employer, Worker I was not allowed to feed the chipper since he was neither trained nor experienced. Neither of the new hires received any training prior to the day of the incident.

First job site

The employer and the four workers along with the crane contractor started working at the first job site around 8 am. The workers were not required to wear any personal protective equipment (PPE), although the employer had hard hats and gloves in his truck that workers could use. The type of gloves that the employer carried were Firm Grip (FG) Utility gloves with loose-fitting short cuffs (Photo 2). The victim was wearing a sweat shirt, jeans,



Photo 2. Gloves provided by the employer with loose-fitting cuffs that may catch branches.

and a pair of FG gloves. He did not wear a hard hat, nor did he wear hearing protection or eye protection.

The tree trimmer stated that he did not see that the employer showed the two new hires how to feed the chipper at the beginning of the job, so he took it on himself and explained the chipper's safety features to his friend and the victim. The employer testified that he did demonstrate to the victim and Worker I how to load the branches on the feed tray and how to turn the machine off. He also showed them how the feed control bar and the "last-chance cables" worked. He instructed them not to feed the chipper when the feed wheels were engaged. However, he also told them that they could feed the chipper when it was in feed mode under one condition: that was when the employer, the ground worker, or the tree trimmer was next to the machine. In other words, the two new workers were allowed to feed the chipper (in feeding mode) with close supervision.

At the first job site, the crew took down 11 trees which were limbed and trimmed a week before by the employer's crew. The tree trimmer attached himself to the ball of the crane and got on the tree tops. He secured the tree sections to be cut with the crane choker and made the cuts before the crane lowered the logs and placed them near the chipper. The employer operated the Dingo to pick up the logs and feed them into the chipper. The chipper winch was also used to pull and move large logs. The three ground workers were dragging and moving the smaller and lighter tree materials and feeding them to the chipper. According to the employer, there was less hand feeding because all the trees were pre-trimmed and limbed.

Second job site

The owner of the second residence site had digital surveillance video cameras installed throughout his property. The work scene was captured by one of the front yard cameras. Two 15-minute video clips included the following images:

- The victim was feeding the chipper as the materials were being pulled into the chipper (feed wheels were engaged);
- The victim and other workers were standing right in front of the chipper while trying to feed a limb;
- The victim was standing between two logs that were being fed into the chipper;
- The victim was sweeping small pieces off the tray and pushing them into the chipper by hand;
- The victim and other workers were leaning down and reaching into the chipper.

The video showed that the owner was near his employees and he did not stop the victim and Worker I from feeding the chipper, nor did he correct their unsafe feeding practices such as leaning and reaching into the chipper and pushing small pieces of trimmings into chipper by hand. The employer stated during the formal hearing that he was surprised to see that the victim was feeding the chipper on the video. At the job site he could not really see what each worker was doing because of the visual obstruction caused by the foliage and branches of the untrimmed tree pieces around the chipper.

Third job site (incident site)

The crew took a half-hour lunch break before starting the third job. They were to take down five trees at this site. All five trees were pre-trimmed and limbed. The incident occurred around 1:15 p.m. when workers were removing the third tree which was a pine. They had just removed the top of the pine. The tree trimmer was on the tree, the owner was cutting the treetop with a chainsaw on the ground, the crane operator was operating the crane, and the rest of the crew was doing ground work. All three ground workers including the victim were feeding the chipper. No one saw the instant when the victim was pulled into the chipper.

The employer stated that he saw the victim right before the incident. The victim was standing by the chipper (on the side of the infeed hopper) and “there was nothing to pick up and put in the chipper”. Less than a minute later, he heard the chipper making a “weird noise”. He turned and saw the victim’s feet sticking out of the chipper. The crane operator stated that he first saw the victim next to the chipper. He turned away in a few seconds and the victim was in the chipper. The tree trimmer was 35 feet up on a tree and he saw the victim about a minute before the incident. He confirmed that the victim was on the side of the chipper and he was not feeding the machine. A minute later with his back facing the chipper, the tree trimmer heard the chipper making a strange noise. He turned and saw the victim in the chipper.

The employer rushed to the chipper and turned it off before calling 911. The crane operator brought the tree trimmer down from the tree with the crane. All the workers gathered together away from the chipper. The EMS and police arrived within minutes and the victim was pronounced dead at the scene.

According to the tree trimmer, all ground workers including the victim were feeding the chipper on the day of the incident. Workers also picked up small pieces of woody materials and fed them into the chipper. Worker I told OSHA that he had picked up small twigs and pushed them into the chipper with his hands and the victim had seen him doing that. He suspected that might have been what the victim was doing when he was caught and pulled into the chipper head first.

Post-incident wood chipper examination

The wood chipper was examined by the representatives of the manufacturer 12 days after the incident. Although the examination did not find any deficiency or malfunctioning parts on the chipper that might have contributed to the incident, it did identify several issues. The owner’s manual and safety DVD were not in the plastic pouch on the machine. The manufacturer required that the manual and DVD should be always on the machine. The original wooden push paddle provided by Bandit was missing, although there were two plastic shovels on the machine. Other issues identified by the manufacturer included a missing hood pin padlock, worn knife blades, broken emergency brake cable, broken brake lights, and missing locking pin on the tray table.

CAUSE OF DEATH

According to the death certificate, the cause of death was severe sharp force and shredding injuries.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. The NY FACE investigation identified the following key contributing factors in this incident:

- Inexperienced and untrained workers were assigned to feed chipper;
- Adequate worker training on chipper hazards and safe feeding techniques were not provided;
- Safe feeding techniques were not followed;
- Workers were not required to wear proper clothing and PPE;
- Adequate supervision was not provided.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that workers follow safe feeding techniques recommended by chipper manufacturers.

Discussion: Failure to follow the safe feeding techniques can lead to deadly caught-in incidents. Employers should ensure that all workers strictly follow the following feeding techniques recommended by OSHA, the National Institute for Occupational Safety and Health (NIOSH), and chipper manufacturers:

- Keep hands and feet outside the infeed hopper;
- Feed brush and limbs into the infeed hopper butt end first and walk away once the feed wheels have grabbed the material;
- Feed from the curbside to avoid being struck by road vehicles;
- Stay at the side of the machine when feeding to allow quick access to the emergency shut-off device and minimize risk of entanglement in branches (Figure 2);
- Use a wooden push tool or a long branch to push the short material or lay short material on top of longer material when feeding;
- Load small raked-up material such as twigs and leaves directly into the chip truck or in trash cans or bags instead of feeding it into the chipper;
- Inspect materials before feeding to make sure that there are no ropes or other foreign materials in the debris;
- Keep the area around the wood chipper free of tripping hazards; and
- Wear proper clothing and personal protective equipment.

The video showed that workers were feeding the chipper while standing directly in front of the hopper and between two branches that were being pulled into the chipper. Workers were also feeding small branches with their hands and leaning down and reaching into the infeed hopper while feeding. These unsafe feeding practices increased the risk of caught-in incidents.

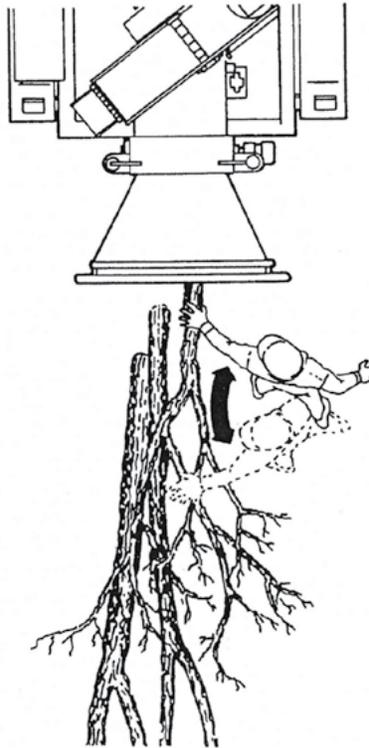


Figure 2. Safe feeding pathway: material fed from side, operator walks away immediately following feeding. (Courtesy of Michigan Occupational Safety and Health Administration, Pub OSC-6125).

Recommendation #2: Employers should ensure that all employees receive proper and adequate training before assigning them to feed wood chippers.

Discussion: Among the varied jobs at a tree work site, feeding a chipper seems simple and straightforward. Compared with operating a chainsaw, it does not need special technical skill. All a worker has to do is to place the branches on the feed tray and make sure that they are caught by the feed wheels. Often young and inexperienced workers are assigned to the task, as in this case.

The most dangerous part of a wood chipper is the feed wheels. The chipper's feed speed in this case was approximately 2 feet/sec. It took the machine less than three seconds to pull a worker standing by the end of the feed tray into the feed wheels. Workers can be pulled into chippers for a variety of reasons such as slipping, tripping, or falling, workers' clothing, gloves, or shoelaces being caught, or unsafe feeding techniques. Tree work is physical, fast paced and mobile and the tasks demand workers' attention. Since caught-in incidents can happen in seconds, simply relying on a buddy system or supervision is neither adequate nor effective to protect workers. Assigning an inexperienced and untrained worker who is more vulnerable and liable to injury to feeding a chipper can result in serious injuries and deaths.

Employers should provide workers with training and education so that they fully understand the hazards associated with wood chippers and the protection measures and the consequences for not following safe feeding techniques. The training should cover the hazards associated with feeding or working near wood chippers, causes and contributing factors of caught-in hazard, proper clothing and personal protective equipment for feeding chipper, safe feeding techniques recommended by chipper manufacturers, proper machine start-up and shutdown procedures, and chipper feed-stop and reverse controls and other safety devices.

Recommendation #3: Employers should ensure that workers wear proper clothing and personal protective equipment when operating/feeding wood chippers.

Discussion: To prevent entanglement hazards, workers should wear close-fitting clothing, gloves and trousers without cuffs, and skid resistant foot wear. Employers should ensure that workers wear the proper clothing and personal protective equipment including hard hats and eye and hearing protection. The gloves that the employer provided in this case had loose-fitting cuffs that could catch branches, although it was unknown whether the victim's gloves were caught.

Recommendation #4: Employers should strictly follow manufacturer’s requirements and instructions when operating and feeding wood chippers.

Discussion: To ensure worker safety, it is important to strictly follow the chipper manufacturer’s requirements and instructions when feeding and operating wood chippers. The chipper in this case was a hand fed type and the employer was feeding the chipper with a Dingo on the day of the incident. Machine fed chippers may have special feeding features or accessories that differ from hand fed chippers to accommodate machine feeding. Feeding a hand fed chipper with a skid steer loader may not only cause damage to the machine, but also present hazards to workers who feed the chipper by hand or work nearby the chipper.

Recommendation #5: Employers should always keep the user’s manual on the chipper and make it accessible to workers.

Discussion: Manufacturer’s chipper operating manual contains important information on hazard warnings, PPE recommendations, chipper safety control features, and safe operating procedures and feeding techniques as well as maintenance safety. Following the manufacturer’s requirements is essential for worker safety. The user’s manual should be kept on the machine so that it can be readily accessed by workers in the field.

Recommendation #6: Chipper manufacturers should develop fully automatic feed control devices to prevent fatal caught-in incidents.

Discussion: The current feed control and stop devices are all mechanical which means that a worker’s action such as pushing or pulling is required to activate these devices. When a worker is trapped and entangled in branches and when he is rapidly pulled towards the feed wheels, many factors can affect his ability to pull the “Last Chance” cables. The worker’s hands may be caught by the branches and he may not be able to pull the cable due to his body position. In addition to physical constraints, human factors, such as fear, confusion, and panic, can further impede a worker’s ability to save himself.

Since a caught victim could be pulled into the machine in seconds, other workers likely are not available to intervene, and the victim’s ability to save himself maybe severely impeded, the most reliable safety devices would be the ones that can be activated automatically.

Patents of fully automatic feed control devices utilizing various technologies are available and some of the technologies were patented more than 20 years ago. A metal detector may be mounted in the infeed hopper and a worker who feeds the chipper wears a metal impregnated glove. If the worker is caught inside the infeed hopper, the metal detector detects the presence of the metal in the worker’s glove and immediately signals the machine’s control system to reverse the feed wheels. An electrical sensor can also be used to detect signals emitted from a band worn by a worker and stop the feed wheels from rotating if the worker is in the infeed hopper. Radio frequency identification technology can also be used to shut down the wood chipper upon detecting the signal. Chipper manufacturers should utilize these technologies to make the chipper emergency controls more effective to prevent fatal caught-in incidents.

Recommendation #7: More research and resources should be dedicated and allocated to help self-employed and small businesses achieve better worker protection.

Discussion: Tree workers are at high-risk for injuries. Most of the tree service businesses are either self-employed individuals or small firms with ten or fewer employees like the employer in this case. These businesses have limited resources and they are less likely to hire in-house safety experts, seek free consultative services from OSHA, or join trade associations to receive membership benefits that include safety training and education. How to effectively reach, educate, and change the mindset of this business population remains a tough challenge for the injury prevention community. Government agencies, trade associations, and safety and health professionals should conduct more research and allocate more resources to help self-employed and small businesses in tree service industry to achieve better worker protection.

DISCLAIMER

Mention of any company or product does not constitute endorsement by the NY FACE and NIOSH. In addition, citations to websites external to NY FACE and NIOSH do not constitute NY FACE and NIOSH endorsement of the sponsoring organizations or their programs or products. Furthermore, NY FACE and NIOSH are not responsible for the content of these websites. All web addresses referenced in this document were accessible as of the publication date.

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INVESTIGATOR INFORMATION

This investigation was conducted by NY FACE, Bureau of Occupational Health and Injury Prevention, Center for Environmental Health, New York State Department of Health.

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New York State Department of Health FACE Program
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