ADMINISTRATIVE REPORT **DATE: February 9, 1999**
PUBLIC HEALTH SERVICE/CDC/NIOSH/DSR
FACE 98-13

TO: **Director, National Institute for Occupational Safety and Health**

FROM: **Division of Safety Research, NIOSH**

SUBJECT: **Groundsman On Tree Trimming Crew Caught In Wood Chipper - North Carolina**

SUMMARY

On May 27, 1998, a 28-year-old groundsman (the victim) died after he was caught and pulled into a wood chipper. The victim and two co-workers, a foreman and a climber, were cleaning up limbs after pruning a tulip poplar tree behind a townhouse. While the tree climber and the foreman were at the rear of the building gathering loose branches, the victim was positioned near the wood chipper, in the cul-de-sac at the front of the townhouse. When the climber approached the chipper with a load of branches, he noticed the victim's legs sticking out of the chipper's feed chute. He ran to the rear of the residence and notified the foreman. The foreman sent him back to shut down the chipper while he called 911. A local emergency rescue squad responded; however, the victim was dead at the scene.

NIOSH investigators concluded that to prevent similar incidents in the future, employers should ensure that:

- manufacturers recommended safe operating procedures are followed when operating machines, and
- at least two people trained to operate the safety bar are present and within sight of each other when material is being fed into a wood chipper

Additionally, employers and manufacturers should:

- evaluate the applicability of additional engineering controls to wood chippers.

INTRODUCTION

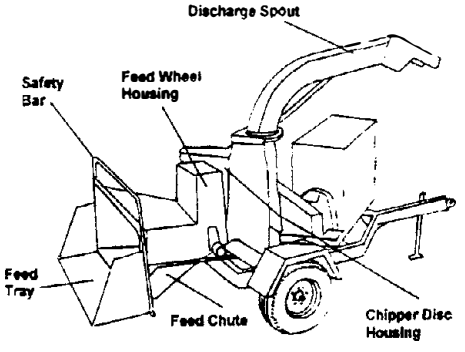
On May 27, 1998, a 28-year-old groundsman (the victim) was caught in and killed by an operating wood chipper. On May 29, 1998, the

North Carolina Occupational Safety and Health Administration (NCOSHA) notified the Division of Safety Research (DSR) of the fatality and requested technical assistance. On June 24, 1998, a DSR safety engineer discussed the case with the NCOSHA compliance officer assigned to investigate the incident. The case file along with photographs and a video were reviewed. The incident was also reviewed with the employer's corporate safety director. On August 23, 1998, a chipper similar to the incident machine was examined and measurements of the feed chute and feed table were taken. Measurements of this machine matched those recorded in the NCOSHA case file.

The employer in this incident was a multi-state tree-trimming service. The company had been in business for over 20 years and employed over 5000 workers in several districts. Nine people were employed in the district in which the incident occurred. The employer had a written safety policy and written comprehensive safety procedures covering all tasks associated with tree trimming. Safety training was provided on the job. Weekly tailgate safety talks were conducted throughout each district, using written discussion papers provided by the corporate safety department. Personal protective equipment such as hard hats, shoes, gloves, chaps, and hearing and eye protection were provided to employees and required to be used. The victim was wearing the appropriate protective equipment and clothing at the time of the incident, including loose fitting non-gauntlet gloves, and a short-sleeve tee-shirt. The victim had worked for the employer for about 4 months. He had been present during a tailgate session about chipper safety which was given about 2½ months prior to the incident. The tailgate session covered all aspects of safe chipper operation including instructions for the workers to be positioned to operate the safety control bar and to use a long forked branch to guide material into the feed chute. This was the company's first fatality.

The machine in the incident (figure 1) was a Bandit Model 250 wood chipper. This is a mobile machine designed to be towed by a truck which is also used to transport the chipped material from the jobsite. The machine consists of a feed mechanism, a rotating chipper disc and a power plant. Tree trimmings and trunk sections are fed into the machine through the feed chute. At the end of the feed chute, are two hydraulically driven feed wheels arranged one above the other on parallel axes. The feed wheels grab the branches fed through the

Figure 1 Wood Chipper



chute and force them into the knives mounted on the rotating chipper disc. The chipper disc operates at high rpm and propels the wood chips through the discharge spout which directs them into the transport vehicle. Power for the machine is supplied by an internal combustion engine.

INVESTIGATION

The incident occurred shortly before 10:30 a.m. on May 27, 1998. The crew had been assigned to prune and stabilize a tulip poplar tree located in the rear of a townhouse. They arrived at the residence about 9:00 a.m. and parked the receiver truck and chipper in front of the townhouse, then went to the rear of the residence. The foreman and climber pruned the tree while the victim watched. The foreman and climber then attached a stabilizing cable between a weak fork of the tree and the main trunk. After this was completed, the crew began to clean up the yard around the tree, raking up and stacking branches and limbs. The victim went to the front of the building, positioned the truck and chipper closer to the work area, and started the chipper. The climber and foreman began dragging brush to the chipper. After they had each made several trips, the foreman engaged the client in a discussion about plans for future work, while the climber continued carrying small brush to the chipper. As he approached the operating chipper with his fourth load of brush, he saw the victim's legs and feet sticking out of the feed chute. He ran to the rear of the building and notified the foreman. The foreman instructed the climber to shut down the chipper while he and the client went to call 911. The climber ran to the chipper, shut down the engine, and returned to the foreman.

The emergency medical squad responded within 5 minutes; however, the victim's head and upper torso had been fed into the chipper knives, and he was dead at the scene.

The crew had been engaged in cleaning up branches of ½ to 1-inch diameter, 3 to 5-feet long and it is conceivable that the victim may have pushed an armload of twigs or short branches into the machine and lost his balance, falling forward and into the feed wheels.

CAUSE OF DEATH

The cause of death was established by the medical examiner as multiple traumatic injury.

RECOMMENDATIONS

Recommendation No. 1: Employers should ensure that manufacturers recommended safe operating procedures are followed when operating machines.

Discussion: The manufacturer's operating/safety manual recommends the following procedures for feeding wood into the machine:

- stand on the right side of the machine
- when feeding short pieces of wood, start longer pieces and then lay short pieces on top
- before feeding large-diameter pieces, start small-diameter pieces first to open the feed wheels. Follow with the large-diameter pieces.
- once limbs have started to feed, turn and walk away. This increases production and decreases the exposure to chips which may fly out from the machine.

The manual warns against attempting to feed handfuls of twigs, leaves and other material that have been raked up. Such materials should be thrown into the receiver truck without being run through the chipper, or fed into the machine using longer branches or a wooden tool to push the material across the feed tray and into the feed wheels. The manufacturer of this machine offers a wooden "push paddle" which can be used to feed small material into the wheels. Any tool used to feed small material should be made entirely of wood. Metallic fittings or fasteners should not be used so that if the operator loses control of the tool and it feeds into the chipper, there will be no hazard of flying metal from the tool.

Recommendation No. 2: Employers should ensure that at least two people trained to operate the safety bar are present and within sight of each other when material is being fed into a wood chipper.

Discussion: Every effort should be made at the job site to ensure that at least two people are present and within sight of each other while wood is being fed into the chipper. The chipper in this incident was equipped with a properly functioning safety bar located around the mouth of the feed chute which was mechanically linked to the hydraulic controls for the feed rollers. The bar was a three-position control: pulling the bar activated the feed wheel rotation for in-feed, pushing the bar to center was a neutral position, and pushing fully forward reversed the feed wheels to out-feed. The employees had been trained in the operation of the bar and to remain in position to activate it while feeding material into the chipper. However, because this bar surrounded the feed

chute, it could not have been activated by a worker after becoming caught by the feed wheels. Workers not actively feeding material into the hopper should remain a sufficient distance from the machine to minimize their exposure to flying chips and debris, becoming entangled in brush which is being fed into the machine by a co-worker or creating a tripping hazard for co-workers. However a second person in visual contact with the victim may have recognized the danger and been able to push the bar to the out-feed position in time to prevent or minimize the injury.

Recommendation #3: Employers and manufacturers should evaluate the applicability of additional engineering controls to wood chippers.

Discussion: The chipper in this incident was equipped with several devices to increase the safety of operation. In addition to the previously mentioned safety bar located around the feed chute, the machine was equipped with a fold-down feed tray. When the tray is folded down the distance from the feed rollers to the edge of the feed chute increases from 31 to 49 inches. The tray can be folded up to facilitate transport of the machine from one jobsite to another. The fold-down tray was intended to make it difficult for machine operators to reach or kick into the feed wheels and to provide an area where small twigs and leaves could be placed and then fed into the chipper with a pushing tool or long branch. Additionally, there were three flexible rubber flaps located across the feed chute 32 inches away from the feed wheels. These flaps were intended to be a physical warning to employees to keep hands away from the feed wheels and to prevent material from flying back out of the chipper. An emergency shut-off device is available from the manufacturer for retro-fitting to existing machines and as original equipment on new machines. Two cables hang inside in front of the feed wheels. The cables are connected to the hydraulic controls so that pulling a cable reverses the feed wheels. Technology is emerging which may allow the use of electronic sensors to eliminate machine-related injury. In one example of this technology the worker would wear gloves made of metal impregnated material. The presence of a worker's hand near the feed chute would be sensed by a metal detector mounted at the opening. The signal could then be used to stop the feed wheels.

REFERENCES

American National Standards for Tree Care Operations- Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and Cutting Brush - Safety Requirements ANSI z133.1-1988. American National Standards Institute, Inc, New York, New York.

Safety System for a Wood Chipper, U.S. Patent No. 453899, 1995. United States Patent Office, Washington, D.C.

Paul H. Moore
Safety Engineer
Fatality Assessment and Control
Evaluation Team
Surveillance and Field
Investigations Branch
Division of Safety Research

Virgil J. Casini
Team Leader
Fatality Assessment and Control
Evaluation Team
Surveillance and Field
Investigations Branch
Division of Safety Research

Dawn N. Castillo
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, Pennsylvania, South Carolina, Tennessee, and Virginia.

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 98-13