NIOSH

FACE

Fatality Assessment and Control Evaluation Program

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Fifteen-Year-Old Hispanic Youth Dies After Entering the Hopper of a Bark Blower - Maryland

SUMMARY

On May 18, 2004, a fifteen-year-old Hispanic youth died after entering the hopper of a bark blower and becoming entangled in an auger. The victim was a member of a two-man crew dispensing mulch onto the back yard of a new residence in a housing complex. The self-contained, truck-mounted bark blower had been filled to capacity with mulch at the company supply yard and driven to the worksite. The mulch was directed to the rear of the bark blower by an auger/agitator and drag conveyor located near the floor surface of the bark blower's hopper. The mulch was then dispensed by the bark blower through a four-inch, metal-reinforced flexible rubber hose. The victim was directing the flow of the mulch through the hose when the bark blower emptied. He was instructed by the foreman to walk approximately 100 feet to the rear right side of the truck and turn off and lock out the box that supplied power to the auger and blower, then return the key to the foreman. When the foreman noticed after a few minutes that the blower was still running, he walked to the rear of the hopper and

Photo 1. Bark blower involved in incident, photo courtesy of Maryland Occupational Safety and Health Administration

Fatality Assessment and Control Evaluation (FACE) Program

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatality Assessment and Control Evaluation (FACE) investigations when notified by participating states (North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia); by the Wage and Hour Division, Department of Labor; or when a request for technical assistance is received from NIOSH-funded state-level FACE programs in Alaska, California, Iowa, Kentucky, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New York, Oklahoma, Oregon, Washington, West Virginia, and Wisconsin. The goal of FACE is to prevent fatal work injuries by studying the work 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. FACE investigators evaluate information from multiple sources that may include interviews of employers, workers and other investigators; examination and measurement of the fatality site, and related equipment; and review of records such as OSHA, police, medical examiner reports, and employer safety procedures and training records. The FACE program does not seek to determine fault or place blame on companies or individual workers. Findings are summarized in narrative reports that include recommendations for preventing similar events in the future. For further information visit the FACE website www.cdc.gov/niosh/face or call toll free 1-800-35-NIOSH.

climbed a fixed ladder and looked inside. He saw the victim at the bottom of the hopper entangled in the auger/agitator. He immediately ran to a nearby residence and asked the owner to call 911. Emergency Medical Service (EMS) and fire personnel arrived and determined this event was a recovery mission. The bark blower was driven to a local fire station where company mechanics and fire and rescue personnel extricated the victim's body. The county coroner pronounced the victim dead at the fire station. NIOSH investigators determined that, to help prevent similar occurrences, employers should

- ***conduct a hazard assessment of machinery to identify potential hazards to which workers might be exposed***
- ***develop, implement and enforce a comprehensive safety program, and provide safety training in language(s) and literacy level(s) of workers, which includes training in hazard recognition and the avoidance of unsafe conditions***
- ***develop, implement, and enforce a comprehensive written program for work in permit-required confined spaces, such as bark blowers.***
- ***establish work policies that comply with employment standards for youth less than 18 years of age in nonagricultural employment. Employers should communicate these work policies to all employees.***
- ***ensure that machinery is operated in accordance with manufacturers' specifications***
- ***implement training programs targeted at youth workers which emphasize the link between unsafe behavior and the potential for injury, and provide constant supervision to younger workers***
- ***ensure that restroom facilities or transportation to restroom facilities are available for mobile work crews***

Additionally manufacturers should

- ***consider and evaluate the installation of grid-shaped guards at the top of bark thrower hoppers and over the auger and drag conveyor during the manufacturing process. Ladder locks to prevent unqualified workers from accessing the top of the hopper should also be evaluated and installed if feasible***
- ***consider affixing dual language labels with graphics to provide hazard warnings and instructions for safe use of equipment***

INTRODUCTION

On May 18, 2004, a fifteen-year-old Hispanic youth died after entering the hopper of a bark blower and becoming entangled in an auger. On May 19, 2004, the U.S. Department of Labor, Wage and Hour Division, notified the National Institute for Occupational Safety and Health (NIOSH),

Division of Safety Research (DSR) of the incident. On July 26-28, 2004, and on August 23, 2005, a DSR senior investigator conducted an investigation of the incident. The incident was reviewed with the Maryland Occupational Safety and Health Administration (MOSH) compliance officer and the U.S. Department of Labor, Wage and Hour investigator assigned to the case. The company owner and coworkers were interviewed and the bark blower was photographed. Photographs taken immediately following the incident by the MOSH compliance officer were obtained. The cause of death was obtained from the county coroner.

The employer was a landscaping service company that had been in operation for 17 years and employed 20 workers, half of whom, including the victim, were Guatemalan. The employer had a basic written safety and training program; however, none of the employees had ever received training in the use of personal protective equipment (PPE), confined space entry procedures, or lockout/tagout procedures. All employees watched a video on the operation of the bark thrower that was supplied both in English and Spanish by the manufacturer. The video explained the operation of the bark blower, including the steps to be taken to turn the machine power off and lock it out. The employer participated in the Department of Transportation and state police inspection programs whereby personnel from both entities performed periodic inspections on the company vehicles, including the bark blowers. Company mechanics also documented periodic maintenance on the vehicles. All vehicle maintenance was performed in the company yard. New employees worked under the constant supervision of the crew foreman during a one-week orientation period. The employer supplied the workers with uniforms and safety equipment, such as dust masks, when necessary. The Guatemalan workers spoke Spanish. The company owner spoke English and Spanish.

At the time of the victim's hire, his mother presented the company owner with a birth certificate that identified the victim as being 17 years of age. The victim had worked for the company for three weeks. Although his primary language was Spanish, he reportedly understood some English. The victim's foreman at the time of the incident was Guatemalan and spoke only Spanish. This was the first fatality experienced by the employer.

INVESTIGATION

The victim and a foreman were dispatched to a new private residence to dispense mulch around various trees and shrubbery in the yard of the residence. To dispense the mulch, the workers used a truck-mounted bark blower (Photo 1).

The bark blower was approximately eight feet wide, 15 feet long, 6½ feet high and was powered by an 80-horsepower diesel engine. The weight of the bark blower was 8,000 pounds and its hopper had a capacity of eight cubic yards. The mulch was dispensed through a blower with a capacity of 830 cubic feet of air per minute at 12 pounds per square inch of pressure. The bark blower had the capacity to dispense 15 cubic yards of bark mulch per hour. The power box for the blower was located on the rear of the passenger side of the hopper approximately 5½ feet above ground. The blower was started by inserting the key, turning it to the on position, then pressing the start button. The blower was deenergized by pressing the stop button, then turning the key to the off position and removing it from the power box. The sides of the hopper converged from seven feet wide at the top to approximately three wide at the bottom. An auger/agitator and drag

conveyor were located at the bottom of the hopper (Photo 2). As the auger/agitator turns it breaks larger pieces of mulch into smaller pieces that the drag conveyor carries to an opening containing a feed roller. The feed roller then transports the mulch into a rotary air valve that channels the mulch into a pressurized air stream created by the blower. The mulch is then dispensed through a four-inch diameter reinforced flexible rubber hose to the desired location.

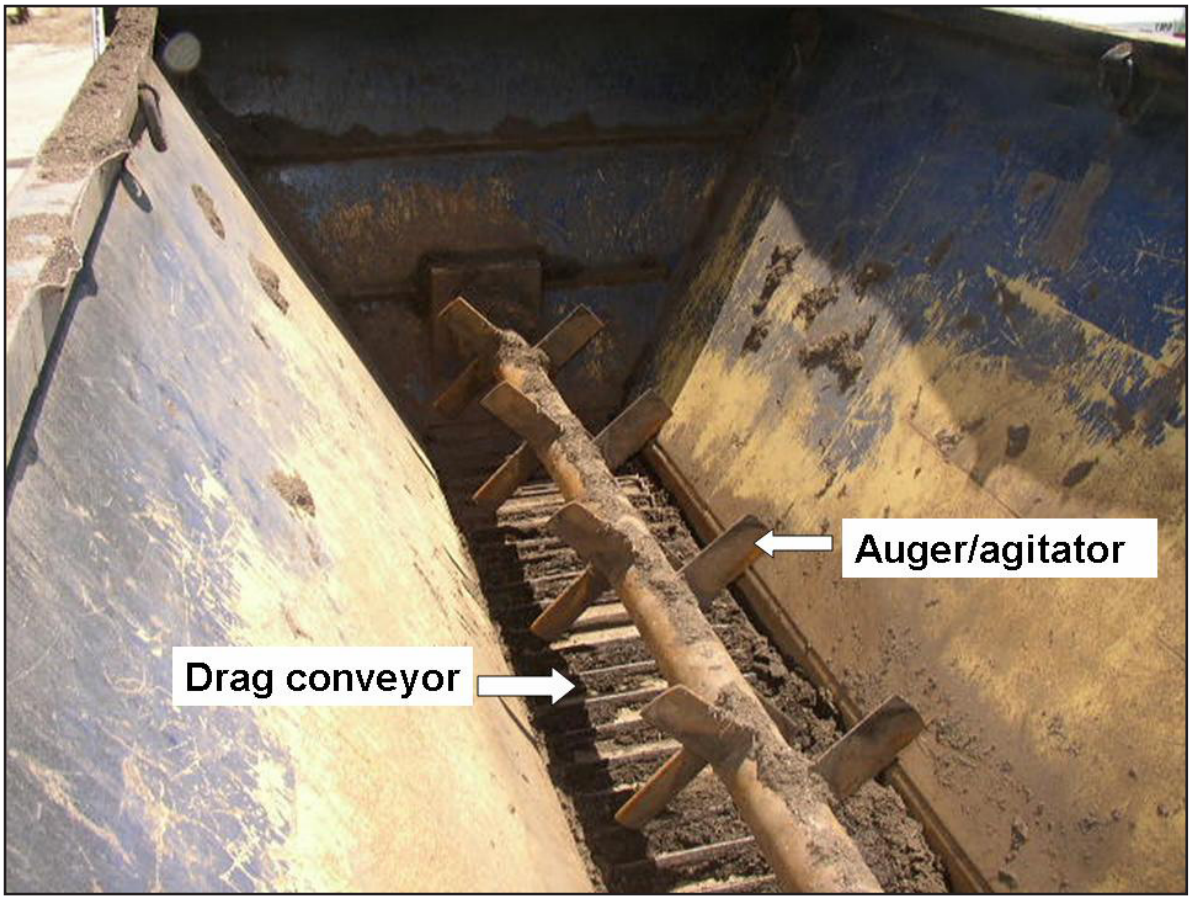

Photo 2. View of the bark blower from the top of the hopper; Photo courtesy of MOSH

When the workers arrived at the site at approximately 8:30 a.m., the truck-mounted bark blower was parked on the side of the street, approximately 100 feet from where the mulch was to be dispensed. They then stretched the flexible hose to the location where the mulch was to be spread. The foreman energized the blower system with his key and started the blower while the victim held the hose and directed the flow of the mulch. This work continued throughout the morning with the two workers alternating between holding the hose to direct the mulch and raking the mulch to a level consistency.

Following lunch the workers resumed their work. Slightly after 2:30 p.m., the bark blower began to blow only air and the foreman determined the hopper was empty. The foreman instructed the victim to walk to the bark blower, turn it off, and return the key to him. The victim turned and walked toward the truck. When the foreman realized the blower was still running after a minute or two, he went to the blower and called to the victim. When he did not receive an answer, he

climbed a fixed ladder at the rear of the hopper and saw the victim at the bottom of the hopper entangled in the auger/agitator. He immediately ran to the residence and asked the homeowner, who spoke Spanish, to call 911. Emergency Medical Service (EMS) and fire personnel arrived and determined this event was a recovery mission. The bark blower was driven to a local fire station where company mechanics and fire and rescue personnel extricated the victim's body at 7:30 p.m. The county coroner pronounced the victim dead at the fire station.

CAUSE OF DEATH

The coroner listed the cause of death as multiple trauma.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should conduct a hazard assessment of machinery to identify potential hazards to which workers might be exposed.

Discussion: Employers should conduct a hazard assessment of equipment to identify any potential hazards to which the workers might be exposed during operation, e.g., the rotating auger/agitator and the rotating drag conveyor. Workers stated during interviews that at times they needed to stand at the top of a fixed ladder at the rear of the hopper and try to move materials from the sides of the hopper down to the conveyor with shovels or pitch forks to allow materials to flow freely. In some instances they stated they entered the hopper to try to kick large rocks or sticks to move them. During OSHA interviews, the foreman working with the victim stated that if no restroom facilities were available, members of his crew would enter the hopper and use it as a restroom facility. Once the auger/agitator and drag conveyor were identified as being hazardous, procedures should be put in place that allow only qualified personnel to enter the hopper, and then only after proper lockout/tagout procedures had been followed.

Recommendation #2: Employers should develop, implement and enforce a comprehensive safety program, and provide safety training in language(s) and literacy level(s) of workers, which includes training in hazard recognition and the avoidance of unsafe conditions.

Discussion: Employers should evaluate tasks performed by workers, identify all potential hazards, and then develop, implement, and enforce a safety program that meets applicable Occupational Safety and Health Administration standards addressing these identified hazards. The safety program should include, at a minimum, worker training in hazard identification, and the avoidance and abatement of these hazards. [1]

Companies that employ workers who do not understand English should identify the languages spoken by their employees and design, implement, and enforce a multi-language safety program. To the extent feasible, the safety program should be developed at a literacy level that corresponds with the literacy level of the company's workforce. Companies may need to consider providing special safety training for young workers or workers with low literacy to meet their safety responsibilities. The program, in addition to being multi-language, should include a competent interpreter to explain worker rights to protection in the workplace, safe work practices workers are expected to adhere to, specific safety protection for all tasks performed, ways to identify and avoid hazards, and who they should contact when safety and health issues arise.

Recently OSHA developed *The Hispanic Outreach Module* to assist employers with a Spanish-speaking workforce in learning more about workplace rights and responsibilities, identifying Spanish-language outreach and training resources, and learning how to work cooperatively with OSHA. In addition, the module provides a list of OSHA's Hispanic/English-as-a-second-language coordinators. These materials are available at http://www.osha.gov/dcsp/compliance_assistance/index_hispanic.html[2] or can be obtained by contacting an OSHA area office. OSHA contact information can be found at http://www.osha.gov. Information provided can be used by employers who are developing or improving safety and training programs for their Spanish speaking employees.

Recommendation #3: Employers should develop, implement, and enforce a comprehensive written program for work in permit-required confined spaces, such as bark blowers.

Discussion: Although employees had received some on-the-job training, they had not received adequate training based on OSHA requirements for a permit-required confined space program, including training in control of hazardous energy. The OSHA standards define a permit-required confined space as a confined space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere;
- Contains a material with the potential to engulf someone who enters the space;
- Has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward or tapers to a small cross section; and /or
- Contains any other recognized serious safety or health hazard.[3]

Since the bark blower falls within this definition, a permit-required confined space program is essential. Such a program has several requirements which include but are not limited to:

- implement necessary measures to prevent unauthorized entry;
- identify and evaluate permit space hazards (e.g. atmospheric, mechanical, electrical, or other injury hazards) before allowing employee entry;
- establish and implement the means, procedures, and practices to eliminate or control hazards necessary for safe permit space entry operations, and allowing only qualified workers to enter the permit space;
- ensure that at least one attendant is stationed outside the permit space for the duration of entry operations;
- implement appropriate procedures for summoning rescue and emergency services, and preventing unauthorized personnel from attempting rescue;
- establish, in writing, and implement a system for the preparation, issue, use and cancellation of entry permits;
- review established entry operations annually and revise the permit space entry program as necessary.[3]

For a complete list of requirements for written permit-required confined space programs, see 29 CFR 1910.146.[4]

Additional recommendations regarding safe work practices in confined spaces can be found in the NIOSH Publication No. 80-106, *Criteria for a Recommended Standard: Working in Confined*

Spaces;[5] NIOSH Alert Publication 86-110, *Request for Assistance in Preventing Occupational Fatalities in Confined Spaces;*[6] NIOSH Publication No. 87-113, *A Guide to Safety in Confined Spaces;*[7] and NIOSH Publication No. 94-103, *Worker Deaths in Confined Spaces: A Summary of NIOSH Surveillance and Investigative Findings.*[8] These publications may be useful in developing confined space safety programs and in training workers to identify hazards found in confined spaces. Specific information provided in these publications includes recommendations for control of hazardous energy, communication procedures, entry and rescue procedures, posted warning signs, and required safety equipment and clothing. NIOSH publications are available through the NIOSH web site at http://www.cdc.gov/niosh or by calling 1-800-356-4674.

Recommendation #4: Employers should establish work policies that comply with employment standards for youth less than 18 years of age in nonagricultural employment. Employers should communicate these work policies to all employees.

Discussion: At the time the victim was hired, his mother presented the employer with a birth certificate that indicated the victim was 17 years old. For this reason, it may have been very difficult for the employer to ascertain the victim's correct age. However, employers should make every effort to ensure they are aware of a worker's true age and that 14-and 15-year-old workers are not assigned to perform prohibited work. These requirements are published in Subpart C of Part 570 of Title 29 of the Code of Federal Regulations, Child Labor Regulation No. 3.

Employers who have a multi-lingual/multi-cultural work force should use interpreters when necessary to inform all employees about age-appropriate work assignments. If employers do not fully understand the types of work prohibited for young workers, they should contact the U.S. Department of Labor (DOL), Employment Standards Administration (ESA), Wage and Hour Division. This Division enforces child labor laws under the Fair Labor Standards Act (FLSA).

Under FLSA standards for 14-and 15-year-olds in nonagricultural employment, employment of 14-and 15-year-olds is limited to certain occupations and under certain conditions that do not interfere with their schooling, health or well-being. For example, the victim was working on a Tuesday, during what would have been school hours. Fourteen and 15-year-olds are prohibited under FLSA standards from being employed in any occupation where they might operate, tend, or assist in the operation of power-driven equipment. Additionally, the FLSA provides a minimum age of 18 years for non-agricultural work which the Secretary of Labor declares to be particularly hazardous (Hazardous Orders). Information regarding FLSA can be obtained by visiting the DOL ESA web site at http://www.dol.gov/esa. FLSA employment standards for nonagricultural occupations are listed and explained in Child Labor Bulletin 101[9] and summarized in DOL Fact Sheet No. 43.[10] Child labor information can also be obtained by calling or visiting offices of Federal and State child labor departments, located by using the telephone directory government pages.

Employers should meet with their workforce to communicate the company's policies regarding appropriate work assignments for young workers. They should explain that young workers are at an increased risk for injury at work and reinforce the importance of assigning youths to appropriate work tasks. They should provide all staff with a description of youth work assignments, identify the person(s) responsible for supervision of young workers, inform all staff about assigned supervisors,

and direct staff to notify supervisors immediately if they see young workers performing hazardous work or working outside their assigned tasks.

Recommendation #5: Employers should ensure that machinery is operated in accordance with manufacturers' specifications.

Discussion: The bark blower consisted of a hopper, an auger/agitator, a drag conveyor, a hydraulic system, and electrical energy provided to the controls. The owner's manual stated that before performing work inside the hopper the truck and power box key should be removed, the battery cables disconnected, the engine operating area should be tagged to show the equipment was being serviced, and to use lockout/tagout procedures to isolate all other hazardous energy sources. Anyone entering the hopper should be trained in these procedures. The mechanic stated during MOSH interviews that he only removed the key from the box supplying power to the bark blower and kept it with him. To ensure the safety of workers, manufacturers' procedures should be strictly followed.

Recommendation #6: Employers should implement training programs targeted at youth workers which emphasize the link between unsafe behavior and the potential for injury and provide constant supervision to younger workers.

Discussion: The victim had received video training on the operation of the bark blower. The victim had also had training to familiarize him with the company's unwritten safety rules and the safe work procedures he would be required to follow. This training was documented. Both the training video and the company safety rules stated that the top of the bark blower hopper was never to be accessed when the bark blower was running. Company policy stated that only the two qualified company mechanics were permitted to access the inside of the bark blower bed. While the training the victim received informed the victim how to perform his job in a safe manner, it did not explain to the victim the consequences he might face if the correct procedures were not followed. Training should be structured so that it identifies the dangers and injuries workers would be exposed to if they should fail to adhere to safe work procedures. This is especially important for younger, more inexperienced workers. Additionally, young, inexperienced workers should be provided constant supervision by a competent person[a] when working around hazardous equipment. Whenever possible, visual contact should be maintained between supervisory personnel and young workers. Resources for training young workers can be found in a NIOSH *Alert: Preventing Deaths, Injuries and Illnesses of Young Workers*[11] available through the NIOSH web site at http://www.cdc.gov/niosh or by calling 1-800-356-4674.

Recommendation #7: Employers should ensure that restroom facilities or transportation to restroom facilities are available for mobile work crews.

Discussion: 29 CFR 1910.141(c)(1)(ii)[12] requires that unless restroom facilities are readily available, mobile crews should have transportation immediately available to nearby toilet facilities.

a A competent person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

In this instance, the crew drove to the incident in the truck on which the bark blower was mounted. There were no facilities available at the site. During OSHA interviews, the foreman working with the victim stated that if no restroom facilities were available, members of his crew would enter the hopper and use it as a restroom facility. The only way to travel to restroom facilities was to stop the job completely and take the truck. Employers should make provisions for access to restroom facilities prior to the start of any job.

Additionally:

Manufacturers should consider and evaluate the installation of grid-shaped guards at the top of bark thrower hoppers and over the auger and drag conveyor during the manufacturing process. Ladder locks to prevent unqualified workers from accessing the top of the hopper should also be evaluated and installed if feasible.

Discussion: In this incident, the victim entered the wide-open hopper of the bark blower. Manufacturers of the bark blower should consider evaluating some sort of grid-shaped guard system that could be incorporated into the design at the top of the bark blower hopper and over the rotating auger and drag conveyor. This system should be designed to allow for the free flow of mulch while the bark blower was being loaded and would prevent inadvertent entrance into the hopper of the bark blower and contact with the auger. The design of the grid system could include a door equipped with a locking device that would allow for entrance for maintenance operations. An interlock system that would automatically shut down the blower system, auger, and drag conveyor if the grid-shaped guard were opened would provide a redundant and more effective safety feature. At the time of the investigation, the manufacturer did not offer any type of guarding system for the top of the hopper or the auger/agitator and conveyor. Additionally, fixed ladders on the bark thrower blower should be equipped with locking devices that would block the ladders and prevent unqualified workers from accessing the top of the hopper.

Manufacturers should consider affixing dual language labels with graphics to provide hazard warnings and instructions for safe use of equipment.

Discussion: Having employees who speak limited or no English presents unique challenges. It is important for Spanish-speaking employees to be able to interpret instruction and warning labels on work equipment such as the bark blower hopper in this incident. While some equipment is bought or shipped with manufacturers' documentation in at least one language other than English, many instruction and warning labels on the equipment are only in English. The machine had labels affixed to the hopper detailing the operating instructions of the machine and the entanglement hazard inside the hopper; however these labels were in English (Photo 3). A dual language label with a graphic or picture label could offer an additional warning to workers of potential hazards.

REFERENCES

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Photo 3. Safety label (in English) warning of the entanglement hazard inside the hopper; Photo courtesy of MOSH

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INVESTIGATOR INFORMATION

This investigation was conducted by Virgil Casini, Senior Investigator, Fatality Investigations Team, Surveillance and Field Investigations Branch, Division of Safety Research.