

## **Landscaper Dies Inside the Hopper of a Truck Mounted Pneumatic Blower - Massachusetts**

**Investigation: # 05-MA-074-01**

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### **SUMMARY**

On November 15, 2005, a 23-year-old male landscaper (the victim) was fatally injured when he became entangled in rotating parts of a pneumatic blower. Prior to the incident, the victim had just finished clearing a jam from the self-contained, truck-mounted, pneumatic blower's hopper and given his two co-workers the "thumbs up" sign indicating that the jam was cleared. The co-workers then restarted the material blower and returned to their task. The material blower then jammed again. The co-workers removed the hose from the material blower and shut down the truck. During this time the co-workers were unable to locate the victim. One of the co-workers climbed up to the top of the hopper to finish clearing the jam and found the victim entangled in the agitators and augers. The co-workers ran to a neighboring house and placed a call for emergency medical services (EMS). EMS responded to the incident site within minutes along with personnel from the local and state police and the Medical Examiners Office. The medical examiner pronounced the victim dead at the incident site. The Massachusetts Fatality Assessment and Control Evaluation (FACE) Program concluded that to prevent similar occurrences in the future, employers should:

- **Develop, implement, and enforce a comprehensive hazardous energy control program including a lockout/tagout procedure and training.**
- **Ensure that machinery is operated in accordance with manufacturers' specifications.**
- **Conduct routine hazard assessments of machinery to identify potential hazards to which workers are exposed.**
- **Develop, implement, and enforce a comprehensive program for work in permit-required confined spaces, such as hoppers.**
- **Develop, implement, and enforce a comprehensive safety program, which includes training on hazard recognition and the avoidance of unsafe work practices and conditions.**

Manufacturers of **pneumatic blower equipment** should:

- **Consider installing grid-shaped guards with interlocks at the top of pneumatic blower hoppers and over the auger and drag conveyor. Ladder locks to prevent unqualified workers from accessing the top of the hopper should also be installed if feasible.**

## **INTRODUCTION**

On November 21, 2005, the Massachusetts FACE Program was alerted by local media that on November 15, 2005, a landscaper was fatally injured when he became caught in landscaping equipment. On January 24, 2006, the Massachusetts FACE Program Director traveled to the company office where multiple representatives of the company were interviewed. The death certificate, police report, corporate information, and the Occupational Safety and Health Administration (OSHA) fatality and catastrophe report were reviewed.

The employer is a family owned full service landscaping and erosion control company that had been in business for 19 years at the time of the incident. The company has one office and approximately 35 employees during peak season, April through December. The 23-year-old victim had been working at the company for less than one year, but had prior experience in the landscaping industry. Company employees are not part of a union collective bargaining unit.

The manufacturer of the pneumatic blower truck provided training on operation of the truck and the pneumatic blower system to the company upon delivery in 2003. The company had a written health and safety program, which included information on general health and safety, as well as specific information on topics such as lockout/tagout. The company provided employees classroom and on-the-job training, although prior to the incident the trainings provided by the company had not been documented. The victim had been trained on the pneumatic blower involved in the incident and had worked with the machine for several months. Five months before the incident, the victim had moved into a mowing foreman position. This new position did not involve working with the pneumatic blower.

## **INVESTIGATION**

The equipment involved in the incident (Figure 1) was a self-contained, truck-mounted pneumatic blower system that was purchased new by the company in 2003. The main function of the pneumatic blower system was to spread a variety of materials, such as mulch, soil and certain sized gravel and stone. The manufacturer of the pneumatic blower system designed the model involved in this incident as an integrated system to be used with a class 8 truck chassis. Power for the pneumatic blower is produced through the truck's engine and a transmission mounted power take off. The pneumatic blower system has a hopper/trailer with a wheel base of 26.5 feet and a loading capacity of 60 cubic yards. The pneumatic blower system weighs 32,000 lbs. when empty. The pneumatic blower's overall length is 38.5 feet, including the truck chassis, and the height is 11.4 feet.

The trailer portion of the system resembles a box trailer with an open top. Access to the top of the open trailer is provided by a fixed ladder attached to the rear of the trailer. At the top of the fixed ladder is a narrow platform the width of the trailer. The space inside the trailer is a hopper for the material that will be blown. The sides of the hopper converge towards bottom of the trailer where a conveyor is located (Figure 2). The conveyor ensures that the material continuously moves towards three agitators and two corkscrew augers located at the rear of the hopper. The material enters the blower system, which is located underneath at the rear of the trailer, after it is fed/pulled through the agitators and corkscrew augers. The output for the pneumatic blower system is four inches in diameter. Hoses are attached to the output and carry material to the desired location. The system is equipped with two sets of controls, one is located on the left side of the truck and the other is a remote control carried by the pneumatic blower operator.

On the day of the incident, the victim arrived at the company office at 7:30 a.m. Due to rainy and cold weather conditions, the victim's mowing jobs had been cancelled for that day. Instead of going home, the victim inquired about helping the pneumatic blowing crew, so as not to lose work hours. The company allowed the victim to work that day assisting the pneumatic blowing crew. The victim and the regular pneumatic blowing crew, which consisted of two co-workers, arrived at the worksite at 8:30 a.m.

The incident site was a wooded area bordering wetlands. The company was hired to install a perimeter filter sock at the wetland's edge. The filter sock's function was to filter runoff water before the water enters the wetland area. The victim's task while on site was to clear a path so the filter sock could be positioned directly against the ground. The filter sock being installed had a twelve inch diameter and was being filled with a composted woodchip material at the time of the incident. The two regular pneumatic blowing crew members' tasks consisted of laying the filter sock and filling the sock with the composted woodchips.

At the time of the incident, the crew had installed approximately 800 feet of the 1,700 feet of filter sock to be laid. At the beginning of the job, the truck had been half full of the composted woodchip material, and when the incident occurred at 2:40 p.m. the truck was one quarter full. The pneumatic blower had jammed while the crew was filling a section of filter sock. It was reported that the workers can tell when the pneumatic blower becomes jammed because there is a tone difference in the truck's engine and the blower system. When the jam was detected, the truck and the blower system were shutdown and the output hose was removed from the blower system by the crew members. The victim then volunteered to un-jam the pneumatic blower. The victim grabbed a shovel and climbed the fixed ladder at the rear of the truck and stood at the top of the hopper on the platform. The victim was using the shovel to disperse the composted woodchips in an attempt to clear the jam. It was reported that when the jam was cleared, the victim gave the co-workers the "thumbs up" hand signal.

The co-workers restarted the pneumatic blower system and resumed the task of filling the filter socks when the pneumatic blower jammed for a second time. The co-workers shut down the truck and removed the output hose from the blower system. This time they could not find the victim. One of the crew members climbed the truck's fixed ladder up to the platform at the top

of the hopper to clear the jam. While standing on the platform he discovered the victim inside the hopper, entangled in the agitators. The shovel the victim had been using to clear the jam was next to him.

The crew members then ran to a neighboring house to place a call for emergency medical assistance (EMS). EMS and local and state police arrived at the site within minutes. EMS personnel pronounced the victim dead at the scene.

When the victim was removed from the box, a large branch was found which might have been the object causing the pneumatic blower to jam. The employer reported that the pneumatic blower system routinely jammed during use. It was unclear if the victim fell into the hopper or climbed down into the hopper.

## **CAUSE OF DEATH**

The medical examiner listed the cause of death as multiple injuries, machinery accident.

## **RECOMMENDATIONS/DISCUSSION**

**Recommendation #1: Employers should develop, implement, and enforce a comprehensive hazardous energy control program including a lockout/tagout procedure and training.**

**Discussion:** In this case, the employer had a hazardous energy control program that included lockout/tagout procedures, but these procedures were not comprehensive. OSHA regulation 1910.147 requires that employers establish procedures for isolating machines or equipment from the input of energy by affixing appropriate locks or tags to energy isolating devices<sup>1</sup>. This is done to prevent any unexpected energization, start-up or release of stored energy that would injure workers during servicing and maintenance of machines and equipment. Lockout/tagout procedures should be developed for each machine and address all forms of energy including electrical, hydraulic, pneumatic, and mechanical. A machine's lockout/tagout procedure should outline the specific requirements and steps to properly perform lockout/tagout on that machine, as well as address when lockout/tagout must be implemented, such as while removing jammed product inside a hopper. For a hazardous energy control program to be effective, the company must provide employees training and strictly enforce lockout/tagout procedures. Enforcing a hazardous energy control program should include random inspections of employee work practices related to the required procedures.

Reviewing comprehensive hazardous energy control programs, including the lockout/tagout procedures and associated training, should be performed at least once a year or when safety concerns arise. Involving employees in the process of updating the hazardous energy control program and training is important. The employer should seek input from employees by having employees evaluate the effectiveness and limitations of the hazardous energy control program. Employers should ask employees about techniques involved in completing tasks that require them to expose any part of their bodies to machine hazards, especially maintenance activities and

common procedures that are not typically thought of as part of the everyday operation, such as removing jammed products from a hopper. Employees who spend the majority of their time operating and performing maintenance tasks on equipment will be able to contribute valuable information that otherwise might be overlooked, such as the hazards of operating the machine and the effectiveness and limitations of the hazardous energy control program.

In this case, the lockout/tagout procedures should specifically include that when an employee has to enter the pneumatic blower's hopper to clear a jam that the pneumatic blower must be locked out by de-energizing, isolating, blocking and/or dissipating all forms of hazardous energy. Then a lock must be affixed by the employee who is entering the hopper to secure the energy isolating device. In addition, the employee entering the hopper must be the only employee with the key to remove the lock in order for the machine to be restarted.

**Recommendation #2: Employers should ensure that machinery is operated in accordance with manufacturers' specifications.**

**Discussion:** In this case, the exact procedure used to shutdown the pneumatic blower after the first jam occurred was unclear. To ensure workers' safety when equipment is being used, the manufacturers' operating procedures, including lockout/tagout during servicing and maintenance of machines, should be strictly followed. Employers should include the manufacturers' operating procedures when training workers on the machines. The manufacturers' recommended lockout/tagout procedures located in the owner's manual included:

- Disengaging the Power Take Off (PTO) and turning off the truck engine to shut down power to all hydraulically controlled operations.
- Removing the key from the truck ignition to create a positive lockout of the PTO and hydraulic systems.
- Turning off electrical power at the master switch, located in the truck's cab, or by disconnecting the truck's batteries.

Also stated in the owner's manual was that if a clog occurs in the feeder or hose, any resulting buildup of pressure could be harmful or cause personal injury, therefore, caution should be exercised.

**Recommendation #3: Employers should conduct routine hazard assessments of machinery to identify potential hazards to which workers are exposed.**

**Discussion:** Employers should conduct hazard assessments of equipment annually and when equipment concerns arise to identify any potential hazards to which the workers might be exposed during operation. When hazards and potential hazards are identified these hazards must then be properly controlled.

Company representatives stated during interviews that the blower system would routinely jam. To clear jams employees would climb the fixed ladder, stand on the platform at the rear of the hopper, and try to move the material inside the hopper with a shovel in an attempt to allow the

material to flow freely. In this case, a hazard assessment could have revealed two hazards employees were exposed to while clearing jammed material: falling into the open hopper and the exposed and accessible augers and agitators inside the hopper. Once identified, procedures to control these hazards, such as guarding of the hopper and lockout/tagout, should be developed and implemented.

**Recommendation #4: Employers should develop, implement, and enforce a comprehensive program for work in permit-required confined spaces, such as hoppers.**

**Discussion:** Because the pneumatic blower's hopper was not being thought of as a confined space, the training that the employer provided for employees did not include the OSHA requirements for a permit-required confined space. The OSHA standard defines a permit-required confined space as a confined space that has one or more of the following characteristics<sup>2</sup>:

- 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
- Contains any other recognized serious safety or health hazard.<sup>3</sup>

According to this definition, the pneumatic blower's hopper would be a confined space. Therefore a permit-required confined space entry program is required. A permit-required confined space program has several requirements which include, but are not limited to:

- Implementing necessary measures to prevent unauthorized entry
- Identifying and evaluating permit space hazards (e.g. atmospheric, mechanical, electrical, or other injury hazards) before allowing employee entry
- Establishing and implementing 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
- Ensuring that at least one attendant is stationed outside the permit space for the duration of entry operations
- Implementing appropriate procedures for summoning rescue and emergency services, and preventing unauthorized personnel from attempting rescue
- Establishing and implementing, in writing, a system for the preparation, issue, use and cancellation of entry permits
- Reviewing established entry operations annually and revise the permit space entry program as necessary<sup>3</sup>

The complete list of requirements for written permit-required confined space programs can be found in the OSHA standard 29 CFR 1910.146, titled Permit-required confined spaces.<sup>2,4</sup>

Additional recommendations regarding safe work practices in confined spaces can be found in multiple NIOSH publications listed at the end of this report in the references section. 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 #5: Employers should develop, implement, and enforce a comprehensive safety program, which includes training on hazard recognition and the avoidance of unsafe work practices and conditions.**

**Discussion:** A comprehensive written safety program that includes training on hazard recognition and the avoidance of unsafe conditions should be developed, implemented, and enforced by employers. In this case, the employer provided on-the-job training for employees that addressed how to operate the equipment, but did not provide training in the recognition of unsafe conditions.

Employers should evaluate tasks performed by employees for all potential hazards (Recommendation #3), such as the hazards encountered when clearing jammed material from the pneumatic blower when the machine is not properly locked out, and incorporate these identified hazards and their controls into hazard recognition training. At a minimum, hazard recognition training should include, but not be limited to, hazard identification, the avoidance of unsafe conditions, and the abatement of identified hazards. Employers should also specify during training that employees should never risk physical harm to accomplish tasks.

It is also important that the training programs' content and the names and dates of employees completing the training should be documented and retained by the employer. Employers should ensure that the trainer who provides training is qualified through education and/or experience to conduct training. As a reference, a summary of the Occupational Safety and Health Administration's (OSHA) draft proposed safety and health program rule, which discusses employee training, has been included at the end of this report.

**Recommendation #6: Manufacturers should consider installing grid-shaped guards with interlocks at the top of pneumatic blower hoppers and over the auger and drag conveyor. Ladder locks to prevent unqualified workers from accessing the top of the hopper should also be installed if feasible.**

**Discussion:** In this incident, the victim entered the pneumatic blower's unguarded hopper. Manufacturers of pneumatic blowers should consider designing and evaluating grid-shaped guarding systems. One of the guards would attach to the top of the pneumatic blower's hopper and a second guard would cover the rotating auger/agitators and drag conveyor. These systems should be designed to allow the material being loaded into the hopper to be free flowing and at

the same time prevent inadvertent entrance into the hopper and contact with the augers/agitators. To allow entrance into the hopper for maintenance operations, the hopper guard could be hinged on one side. An interlock system should also be included that would automatically shut down the blower system, auger/agitator, and drag conveyor if the hopper guard was opened. In addition, fixed ladders on pneumatic blowers should be equipped with locking devices that would block the ladders and prevent unqualified workers from accessing the top of the hopper.

## REFERENCES

1. Code of Federal Regulations [1996]. 29 CFR 1910.147. The Control of Hazardous Energy (Lockout/tagout). Washington, DC: U.S. Printing Office, Office of the Federal Register
2. Code of Federal Regulations [1998]. 29 CFR 1910.146. Permit-required Confined Spaces. Washington, DC: U.S. Printing Office, Office of the Federal Register.
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4. OSHA [2004]. Permit-required confined spaces. Occupational Safety and Health Administration (OSHA) Publication No. 3138-01R 2004.
5. Code of Federal Regulations [2004]. 29 CFR 1910.146. Permit-required confined spaces. Washington DC: U.S. Government Printing Office, Office of the Federal Register.
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8. NIOSH [1987]. [A guide to safety in confined spaces](#). Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 87-113.
9. NIOSH [1994]. [Worker deaths in confined spaces: A summary of NIOSH surveillance and investigative findings](#). Cincinnati, OH: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, DHHS (NIOSH) Publication No. 94-103.

**Figure 1 – Same model as the pneumatic blower truck involved in the incident**



**Figure 2 – Inside the hopper of a similar pneumatic blower truck. The bottom of the photo shows a section of the platform, below the platform (not visible in the photo) is the location of the augurs and agitators.**



## SUMMARY OF OSHA'S DRAFT PROPOSED SAFETY AND HEALTH PROGRAM RULE FOR EMPLOYERS

(29 CFR 1900.1 Docket No. S&H-0027)

### Core elements

- Management leadership and employee participation
- Hazard identification, assessment, prevention and control
- Access to information and training
- Evaluation of program effectiveness

### Basic obligations

- Set up a safety and health program, with employee input, to manage workplace safety and health to reduce injuries, illnesses and fatalities.
- Ensure that the safety and health program is appropriate to workplace conditions taking into account factors such as hazards employees are exposed to and number of employees.
- Establish and assign safety and health responsibilities to an employee. The assigned person must have access to relevant information and training to carryout their safety and health responsibilities and receive safety and health concerns, questions and ideas from other employees.

### Employee participation

- Regularly communicate with employees about workplace safety and health matters and involve employees in hazard identification, assessment, prioritization, training, and program evaluation.
- Establish a way and encourage employees to report job-related fatalities, injuries, illnesses, incidents, and hazards promptly and to make recommendations about appropriate ways to control those hazards.

### Identify and assess hazards to which employees are exposed

- Conduct inspections of the workplace at least every two years and when safety and health information change or when a change in workplace conditions indicates that a new or increased hazard may be present.
- Evaluate new equipment, materials, and processes for hazards before introducing them into the workplace and assess the severity of identified hazards and rank those hazards that cannot be corrected immediately according to their severity.

### Investigate safety and health events in the workplace

- Thoroughly investigate each work-related death, serious injury, illness, or incident (near miss).

### Safety and health program record keeping

- Keep records of identified hazards, their assessment and actions taken or the plan to control these hazards.

### Hazard prevention and control

- Comply with the hazard prevention and control requirements of the OSHA standards by developing a plan for coming into compliance as promptly as possible, which includes setting priorities and deadlines for controlling hazards and tracking the progress.

### Information and training

- Ensure each employee is provided with safety and health information and training.
- If an employee is exposed to hazards, training must be provided on the nature of the hazards to which they are exposed to and how to recognize these hazards. Training must include what is being done to control these hazards and protective measures employees must follow to prevent or minimize their exposures.
- Safety and health training must be provided to current and new employees and before assigning a job involving exposure to a hazard. The training should be provided routinely, when safety and health information is modified or a change in workplace conditions indicates a new or increased hazard exists.

### Program evaluation and maintenance

- Evaluate the safety and health program at least once every two years or as often as necessary to ensure program effectiveness.
- Revise the safety and health program in a timely manner once deficiencies have been identified.

### Multi-employer workplaces

- The host employer's responsibility is to provide information about hazards and their controls, safety and health rules, and emergency procedures to all employers at the workplace. In addition, the host employer must ensure that assigned safety and health responsibilities are appropriate to other employers at the workplace.
- The contract employer responsibility is to ensure that the host employer is aware of hazards associated with the contract employer's work and how the contract employer is addressing them. In addition, the contract employer must advise the host employer of any previously unidentified hazards at the workplace.