MIFACE INVESTIGATION: #01MI056

SUBJECT: Grader Operator Run Over by Rear Tire While Jumpstarting Grader

Summary

On July 30, 2001, a 63-year old male died from injuries sustained when he was run over by the rear wheel of a grader. A coworker driving a bulldozer was spreading gravel and the grader was following the bulldozer leveling the gravel. The grader stalled and would not restart. The bulldozer drove behind the grader, and pushed the grader to a location where the bulldozer could be used to jumpstart the grader. The victim attempted to jumpstart the grader with jumpstart cables but was unsuccessful because the grader was in 1st gear. The victim left the cab. He stood between the rear tires and used pliers to jumpstart across the solenoid. When the engine started, the grader moved forward, running over the victim with the rear tire. The coworker shut down the grader after the blade struck a bank of dirt and stopped moving. The coworker ran to the highway and flagged down a car to call for emergency assistance. The motorist's cell phone could not get a signal. While the coworker was using the motorist's cell phone, another company employee arrived with a load of gravel. The truck driver drove to another area on the road, contacted the office. The office called for an ambulance service (911 emergency service is not available. The ambulance personnel arrived 15 minutes after being notified of the incident. The victim was declared dead at the scene.

RECOMMENDATIONS

- Employers should discourage jumpstarting equipment; if absolutely necessary, jumpstarting a piece of equipment should be allowed only from the battery while the operator is in the equipment cab.
- Company policy should prohibit use of equipment if not in proper working order, remove from service all equipment in need of repair until repairs are made, strictly enforce employee reporting of defective equipment.
- Equipment owners should ensure that an owner and/or operator manual is available on the equipment and for use in service/maintenance procedures.
- Employers must ensure that a person with a valid certificate in first aid training is present at the worksite to provide first aid.
- Company management should consider developing a joint health and safety committee.
- Employers should provide all field personnel a means for emergency communication in case of injury.

INTRODUCTION

On July 30, 2001, a 63-year old male died from injuries sustained when he was run over by a grader while jumpstarting the grader. On August 1, 2001, MIFACE received notification of this fatality via the MIFACE web site from an area resident who read a newspaper article of this incident. MIFACE investigators notified MIOSHA of this fatality. A MIOSHA investigation was initiated based on the MIFACE notification. The company owner agreed to participate in the MIFACE program, and the MIFACE researcher visited the company headquarters, incident site and an unrelated site to view the motor grader on December 6, 2001. The MIFACE researcher talked with a witness (bulldozer operator) and another grader operator. The death certificate, autopsy results, municipal police report, company safety policy, and a copy of the citations issued to the employer were obtained during the course of the investigation. MIFACE requested, but did not receive, the grader's maintenance record.

MIOSHA issued three citations to the company. One citation was failure to notify MIOSHA within 8 hours of occurrence, one was for cracked cab glass, and one was for the lack of certified first aid provider on-site.

INVESTIGATION

The company employs about 20 people, and had been in business for over 30 years. The company is a construction company that buys land, and sells it for hunting and recreation. The company is also a general construction company that performs excavations for landfills, and sludge hauling. The company had a written safety policy. Company safety policy required employee attendance at safety meetings, and all new employees are oriented and trained individually by the owners on the company's safety procedures. At the time of the incident, there was not a written policy for jumpstarting a piece of equipment; a jumpstarting procedure (operator must be in the cab when jumpstarting a piece of machinery) was added to the policy after the fatality. The company does not have a safety and health committee. The owner is responsible for safety and relies on his experience in construction for safety precautions.

The victim's job title was grader operator; there were 3 other employees with the same job title. The victim had been employed at various times with the company and had over 40 years of experience operating a grader. He was a part-time worker, working 15-20 hours a week.

The grader used by the operator was a Galion T-500, built in 1970. The company purchased the machine used. It did not have an operator's manual in the cab. The front cab glass was cracked, but visibility was not restricted. The turn signals did not work, but that was not a factor in this incident.

The company had purchased land and was putting in a road back to an area where there was future home construction. The road construction operation had been going on for approximately 3 months. The road was dirt covered, and the two employees working at the site were laying gravel/rock on the road surface. A dump truck had previously delivered a load of gravel. The bulldozer was distributing the gravel, and the grader was leveling the gravel on the road. It had been raining that morning. The ground was muddy.

The victim usually used this grader when he performed work at the company. The grader was at a different location in the morning of the incident. The grader was jumpstarted in the morning with a pickup truck, and driven on the road by the victim to the incident location. While spreading the gravel behind the bulldozer, the grader stalled. The victim exited the grader cab. The grader location would not allow the bulldozer to get close enough to use the bulldozer battery to jumpstart the grader. The bulldozer drove around to the back of the grader, and pushed the grader forward to place it in a position to be jumpstarted by the bulldozer. The grader operator retrieved jumper cables from his truck while the dozer operator came along side next to the grader, approximately 5 feet away. The grader was facing west, the bulldozer operator was facing east.

It is unknown if the victim kept the grader in 1st gear or placed the grader in neutral while being moved into the position by the bulldozer. Because the grader was in gear during the jumpstart, a safety switch prevented the engine from starting. The safety switch allows the grader to be started only when the gear is in neutral; if in gear, the grader will not start. The key was in the “on” position. The cover is left off in the summer to assist in cooling the compartment; it had not been replaced when the grader was observed in the winter.

The victim placed the jumpers on the bulldozer battery and the positive jumper lead on the grader solenoid, and the negative on the grader frame. The victim did not use the battery to jumpstart the grader; he hooked directly to the solenoid. The solenoid regulates the power from the battery to the starter. This was the first time the dozer operator saw the victim jumpstart directly from the solenoid. The victim climbed inside the grader cab and attempted to start the grader. With the bulldozer running, it was probable he could not hear if the engine was turning over.

The victim apparently did not notice that the grader was in gear when he exited the cab to attempt a jumpstart from the ground. Standing in an unsafe position between the rear tires, the victim used pliers to jumpstart the grader. He placed the pliers across the positive terminal and the starter switch terminal on the starter solenoid. Jumpstarting across the solenoid eliminates the safety switch capabilities. Because the grader was unintentionally in gear, when the engine started, it began to move forward. The victim was unable to get out of the way of the back rear tire, and he was knocked to the ground by the rear tire and run over.

The coworker ran after the grader as it was heading toward the road. The grader veered to the right, and the blade struck a pile of dirt, stopping the forward movement of the grader. The coworker entered the grader cab, throttled down, placed the gear in neutral and shut off the machine. Figure 1 shows the position of the levers when the bulldozer operator turned off the machine. He ran to the road to flag down a passing motorist to use a cell phone to call for emergency assistance. The motorist's cell phone could not get a signal at the incident location. While he was calling, another company employee with a cell phone in his truck arrived with a load of gravel. He drove to a different location on the road and called the company office. The company office arranged for emergency assistance; the area does not have 911 emergency assistance. The ambulance personnel arrived 15 minutes after being notified of the incident. The victim was declared dead at the scene.

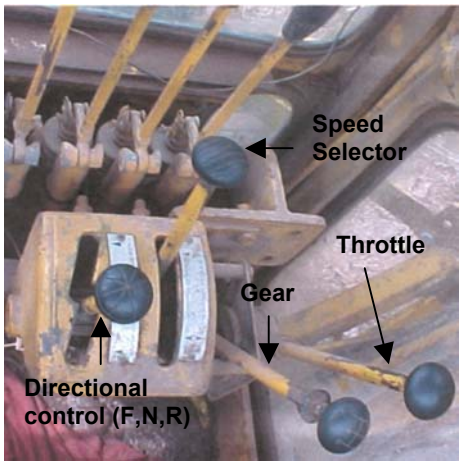

Figure 1

The job was finished the next day using a bulldozer to spread the gravel. When the grader was removed from the location, the grader required several jumpstarts while being loaded on a trailer for transport back to the company office. The grader operator who removed the grader from the incident site determined the cause of the repeated stalling of the grader. He noticed that when the grader fan was blowing, it would pick up the wire (Figure 2) that feeds power from the battery to the ignition inside the operator cab. This lost wire connection from the solenoid caused the grader to stall, and made it appear that there was a dead battery.

Figure 2

CAUSE OF DEATH

The cause of death as stated on the death certificate was traumatic asphyxia due to crushing injury to the back. The victim's blood and urine could not be obtained for toxicological analysis due to pre-autopsy embalming. There was no suggestion during the investigation that illegal drug use or alcohol use played a role in the death.

RECOMMENDATIONS/DISCUSSION

- Employers should discourage jumpstarting equipment; if absolutely necessary, jumpstarting a piece of equipment should be allowed only from the battery while the operator is in the equipment cab.

The company safety policy was amended to include a statement about jumpstarting equipment. The new jumpstart safety policy states: "RE: Jumpstarting equipment – If necessary to jump start equipment, it is required that an operator **MUST** be in the cab, at the seat of the machine. Disciplinary action will be imposed if this procedure is not followed. If your truck or equipment does not start, call the mechanic at the shop for assistance, or return to the shop and report to the mechanic."

The company does not discourage jumpstarting equipment, only that an operator must be in the cab during the procedure. MIFACE recommends that the company discourage jumpstarting a machine. If the machine requires a jumpstart, it is likely that the machine is in need of service, and should be taken out of service and returned to the shop. MIFACE also recommends jumpstarting should be authorized only when necessary to return the machine to the shop, and only the equipment battery should be used to jumpstart the machine.

The company tagged the equipment with a safety alert warning tag which alerts the employee to the dangers of jumpstarting at the starter and starting the equipment while standing on the ground. The tag recommends keeping the starting system in repair, and keeping the starter solenoid cover in place. The company had not placed a solenoid cover on the solenoid. Jumpstarting from the solenoid bypasses all safety switches; the equipment battery should be used to perform the jumpstart.

- Company policy should prohibit use of equipment if not in proper working order, remove from service all equipment in need of repair until repairs are made, and strictly enforce employee reporting of defective equipment.

Three company safety policy rules addressed defective equipment: operation of equipment that posed an immediate danger to the employee or public was prohibited, operators shall report equipment defects found while on the jobsite or during hauling, and all equipment must be examined for defects and defects repaired before the equipment is permitted to leave the yard. The company safety policy permits employees to continue to operate defective machinery in the field; the policy does not state that defective equipment should not be used. The victim, earlier in the day was required to jumpstart the equipment. The employee did not report the malfunction to the company mechanic as required by the company policy, and he continued to use the defective equipment in the field. Company policy addresses only equipment defects identified while in the yard, not in the field.

The grader turn signals were not functional. This posed a hazard to the employee and the public while the grader was driven to the incident site from another location. This condition should have required the grader to be hauled, not driven, to the site to protect both the employee and public. It is unknown if the victim reported this condition to maintenance.

The failure to maintain equipment in proper operating condition can result in hazardous situations that may increase the risk of workers being injured. All equipment should be examined daily for defects and needed repairs. Inspecting and checking equipment by operating personnel should also be integrated into their work procedures. In order to make certain that the inspection is performed, the employer should develop an inspection checklist.

- Equipment owners should ensure that an owner and/or operator manual is available on the equipment and for use in service/maintenance procedures.

The grader was purchased used and placed into operation. An operator's manual was not available for operator use and the employer did not know if there was an operator's manual for the grader at the company. In order to know if the machine is being properly operated and maintained, an owner's manual is required. The manual will serve as the standard from which to make decisions on installation, operations and repair. Guidelines on safety, maintenance, and other key information are commonly provided in manufacturers' specifications and are key to developing appropriate safety and maintenance procedures.

- Employers must ensure that a person with a valid certificate in first aid training is present at the worksite to provide first aid.

The employer did not have an employee trained in first aid as required by MIOSHA Construction Safety Standard Part 1, General Rules, Rule 132. The lack of first aid training was not a factor in this incident due to the severity of the victim's injury. Under different circumstances, however, the lack of a certified first aid responder at the worksite could play a crucial role for a person to survive a serious injury and prevent a fatality.

- Company management should consider developing a joint health and safety committee.

The main reason for developing a Health and Safety (H&S) committee is to encourage and heighten employee involvement in the company safety program. Employee input is a critical part of a successful safety program. An H&S Committee is one way to obtain that input. The level of involvement by employees and degree of management commitment will determine if an H&S Committee is successful.

H&S committees have many benefits; identify safety and health concerns that workers/management consider most critical, help find creative solutions, shows a good faith effort toward health and safety regulations, boosts coworker loyalty, morale and enthusiasm by getting involved in an issue that's important to everyone, and if new safety rules are needed, an H&S committee can help make sure employees accept and follow them.

Prior to forming the H&S committee, management should: define the H&S committee's Mission Statement, define the role/function of the Committee, determine the meeting schedule, and determine the length of the meeting. Committee members should be those interested in safety issues and have direct knowledge of the company's operations. H&S committees work best if there are representatives from both management and employees.

A sample mission statement could state:

The mission of the *(Company Name)* Health and Safety Committee will be to provide leadership in safety and work toward the elimination of workplace injuries and illnesses. The H&S Committee will work to:

1. Assist the company to identify, evaluate and resolve workplace health and safety concerns.
2. Assist in developing and distributing health and safety policies and procedures.
3. Conduct periodic surveys and inspections to identify hazards and recommend corrective actions.
4. Consider recommendations or suggestions concerning health and safety issues.
5. Help to identify employee training needs.

- Employers should provide a means for emergency communication in case of injury.

Only truck drivers had vehicles equipped with a means to communicate with the company office. The victim and coworker did not have a means of emergency communication at the worksite. The coworker was unable to obtain a signal from a passing motorist's cell phone at the incident location. Although the lack of emergency communication was not a factor in this fatality due to the circumstances involved, the lack of communication to emergency responders could play a crucial role in the survival of a serious injury and preventing a fatality in the future.

Employers working in remote areas should contact a local cellular phone or 2-way radio company for methods to insure communication to either the company's corporate site or to emergency response personnel. If a company relies on cellular telephones as a means for communication, the phone must be tested at each work site to determine if a signal can be obtained before the telephone is relied upon to provide emergency communication.

The external antenna is a major factor in the capability of the communication device to pick up a signal. The external antenna should be selected based on the terrain of the area the phone will be used in. If the area is mountainous or in the city, an antenna with a unity gain or 0 decibel antenna should be selected because the antenna radiates the same horizontally as vertically. Antenna height is also a factor in how well a cellular phone or a 2-way radio can pick up a signal. The taller the antenna, the better it is in picking up a signal. A local repeater can be used to increase the range of communication. A repeater is a specially built receiver and transmitter pair that receives signals from low power handheld or mobile radios and retransmits them using a better antenna and more transmitter power. An employer can rent use of an existing repeater system that is shared. There is also a Specialized Mobile Radio Service (or SMR)

systems that operate similar to the basic repeater and provide coverage over wide areas. If a 2-way radio is selected, a license may be required from the Federal Communications Commission.

REFERENCES

MIOSHA Standards cited in this report can be found at the Consumer and Industry Services, Bureau of Safety and Regulation Standards Division website at http://www.cis.state.mi.us/bsr/divisions/std/std_rule.htm. The Standards can also be obtained for a fee by writing to the following address: Department of Consumer and Industry Services, MIOSHA Standards Division, P.O. Box 30643, Lansing, MI 48909-8143. MIOSHA phone number is (517) 322-1845.

MIOSHA Construction Safety Standard Part 1, General Rules, Rule 132.

MIFACE

Investigation Report # 01 MI 056

Evaluation

To improve the quality of the MIFACE program and our investigation reports, we would like to ask you a few questions regarding this report.

Please rate the following on a scale of:

Excellent	Good	Fair	Poor
1	2	3	4

What was your general impression of this MIFACE investigation report?

1 2 3 4

Was the report…

Objective?	1	2	3	4
Clearly written?	1	2	3	4
Useful?	1	2	3	4

Were the recommendations …

Clearly written?	1	2	3	4
Practical?	1	2	3	4
Useful?	1	2	3	4

How will you use this report? (Check all that apply)

- o Distribute to employees/family members
- o Post on bulletin board
- o Use in employee training
- o File for future reference
- o Will not use it
- o Other (specify) _____

Thank You!

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