NIOSH

FACE

Fatality Assessment and Control Evaluation Program

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# *18-year-old Dies After Being Entangled in a Portable Mortar Mixer - South Carolina*

## SUMMARY

On May 15, 2003, an 18-year-old laborer (the victim) died after becoming entangled in a portable mortar mixer. The victim was cleaning the mixer at the end of his shift at a residential construction site to prepare it for the following day while a co-worker was brushing down the recently laid brick wall nearby. A painter working near the victim heard yells for help and saw the victim's arm stuck in the machine and his body being pulled into the rotating mixer paddles. He ran to the mixer and attempted to turn it off but could not disengage the gears so he yelled for help. The co-worker heard the commotion, ran to the machine, and shut it off. Emergency Medical Services was called and responded within minutes. Rescue workers dismantled the drive mechanism to reverse the mixing paddles and extricated the victim. The victim was pronounced dead at the scene. NIOSH investigators concluded that, to help prevent similar incidents, employers should:

*Portable Mortar Mixer*

- ***develop, implement and enforce a written safety program which includes, but is not limited to, task-specific hazard identification, avoidance and abatement***
- ***train employees in the recognition of hazards, methods to control such hazards, and conduct and document regular safety meetings***

**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 at www.cdc.gov/niosh/face/faceweb.html or call toll free 1-800-35-NIOSH.

- ***ensure that equipment is operated according to the manufacturer's specified procedures***
- ***assign safety responsibilities to a competent* person at each job site***
- ***establish basic elements of a lock-out/tag-out program***
- ***assure all warning labels on the equipment are clearly visible and equipment is properly maintained***

Additionally, manufacturers should:

- ***consider installing a safety switch so that the engine cuts off when the guard is disconnected or removed from the drum guard lifter***
- ***consider installing an engine kill switch on the machine***

## INTRODUCTION

On May 15, 2003, an 18-year-old laborer (the victim) for a brick laying company died after becoming entangled in the rotating mixing paddles of a portable mortar mixer. On May 21, 2003, the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), was notified of the incident by the South Carolina Department of Labor, Licensing and Regulation, Office of Occupational Safety and Health Administration (SCOSHA). On June 18, the Team Leader for the Fatality Assessment and Control Evaluation (FACE) program met with a compliance officer at the SCOSHA to review the case. On June 29, 2003, the Chief of the DSR Trauma Investigations Section and an Associate Service Fellow met with the owners of the company, and inspected and photographed the mixer. The case was discussed with the county coroner and local police and photos taken by the agencies were reviewed. The case was discussed via phone with the Vice President of Engineering at the mixer's manufacturing facility and the operator's manual was reviewed.


*Photo 1. Mixer with drum guard fully open*

The brick and masonry contracting business had been in operation for over 20 years. The company employs seven persons—five laborers and two brick masons who were co-owners of the business. The company specializes in residential construction and this was the company's first workplace fatality.

The machine, an 8-cubic-foot portable mortar mixer with a gasoline powered 8-hp engine was purchased new by the company in 1998 (Photo 1). It is equipped

*According to OSHA, a competent person is one who is capable of identifying existing and predictable hazards in surroundings or conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective action to eliminate them (29 CFR 1926.32 (f)).


*Photo 2. Guard lifter attached with guard in closed position*

with an automatic guard lifter which lifts the drum guard as the drum is emptied to prevent mortar from being poured through the guard and causing build up. In normal operation, lifting the drum guard gives about eight inches clearance for the mortar to pour through. Photo 2 shows the mixer drum in an upright position with the guard in place. The mixing paddles in the drum are engaged by moving the clutch lever [located on the vertical support on the right side of the drum] to the right (downward) (Photo 3). An upright (disengaged) lever position is shown in Photo 4. Moving the clutch lever downward engages the paddles regardless of the drum position. A drum latch (Photo 2) in the downward position secures the drum upright while the rubber tipped paddles rotate between 33 and 35 revolutions per minute to mix the mortar. The machine was in fair condition and had the manufacturer's installed guarding at the time of the site visit. It had been repainted and a gear replaced since the incident.

Upon hire, the company owners give training on specific tasks related to the job. In this case, demonstrations on the use of the portable mixer were provided to the victim by one of the company owners. All training is hands-on and no documentation of training is completed. Certification or licensing of the machine or operator is not required. Routine checks of the machine are conducted by the owners to assure proper operation. Operator proficiency is evaluated by the owners through demonstration and follow-up observation.


*Photo 3. Clutch in the 'on' position, paddles rotating*


*Photo 4. Guard off, clutch in the 'off position*

The company lacks a comprehensive written safety training program or related policies. Tailgate safety meetings are held as needed by the company owner. One owner reported that three days prior to the incident, the mixer was the primary topic of the tailgate safety meeting. The victim worked for the company as a laborer for 4 months, 40 hours per week. His primary responsibilities included mixing mortar, hauling it to the brick layer in a wheelbarrow, and transporting bricks from a pallet to the brick mason work area.

## INVESTIGATION

The day of the incident, the victim, one mason and one site foreman, who was not a co-owner, were at a private residence bricking a pool house. Work began at 7:00 am in 70 degree warm and dry conditions. The victim mixed mortar, carried brick, and prepared the site for the brick mason. At the time of the incident, a painter, not employed by the brick and masonry contractor, was in the area and a lawn crew was mowing the yard and doing landscape maintenance.

The mixer was set up on a driveway adjacent to a pile of sand. The crew had been at this site about 40 days prior to the incident and was nearly done with the project. The foreman left the site about 3:00 pm to check on another job. At approximately 3:20 pm, the victim was told by the mason to clean out the mixer in preparation for the next day. This was a routine procedure done at the end of each day to prevent the mortar from curing or setting up on the mixing paddles or the sides of the mixing drum. The mason then went to another part of the job site to brush the brick wall he had just laid.

The victim had turned the drum so the opening was directed toward the ground allowing water to drain out. Using a garden hose in his right hand, the victim sprayed the paddles and inside of the drum loosening the mortar and allowing the residue to drain out. During this procedure the engine was running, mixing blades rotating, guard lifter disconnected and drum guard fully open. The victim then rotated the drum upright and continued spraying water into it. The painter reported that he heard a scream, saw the victim's arm get caught, and ran to the mixer attempting to shut it off. He could not shut the engine off so he called for others to help. By this time the victim had been pulled into the machine.

A crew of Spanish-speaking lawn maintenance workers ran to the scene after hearing the painter yell for help. This commotion caused the brick layer to take notice and run toward the mixer from around the far side of the pool house. Seeing the victim's leg protruding from the top of the mixer and hearing the engine running, the brick layer disengaged the mixing paddles by moving the clutch lever upward. He then turned the engine off. A neighbor called 911 and the rescue squad and police arrived within minutes. The rescue squad personnel removed the belt to disengage the blades so they could be rotated in reverse to free the victim. The victim was pronounced dead at the scene.

## CAUSE OF DEATH

The coroner determined the cause of death to be asphyxia due to compression of neck structures by concrete mixing device.

## RECOMMENDATIONS/DISCUSSION

***Recommendation #1: Employers should develop, implement and enforce a written safety program which includes, but is not limited to, task-specific hazard identification, avoidance and abatement.***

Discussion: Employers should evaluate all tasks performed by workers; identify all potential hazards; and then develop, implement, and enforce written safe work procedures addressing these tasks. The safety program should include at a minimum how workers can protect themselves from injury. In this case, no written safety program or procedures were available. A written program offers consistency in safety procedures and could have informed the worker of the dangers related to cleaning the mixer. The safety program should emphasize the link between unsafe behavior and the potential for injury. Written task-specific procedures should be a part of the safety program and regular structured safety meetings should be held and documented.

***Recommendation #2: Employees should train employees in the recognition of hazards, methods to control such hazards, and conduct and document regular safety meetings***

Discussion: Employers are required by 29 CFR 1926.21 (b)(2) to instruct each employee in the recognition and avoidance of unsafe conditions, and to control or eliminate any hazards or other exposures to illness or injury. Employers need to provide training that ensures that employees understand existing hazards and how to properly control these hazards. In this instance, the worker could have recognized the hazard of cleaning the unit without the guard in place. There is no evidence that the victim had ever received training on the risks of operating the mixer without the guard other than the reported demonstration. It was reported the cleaning operations were demonstrated to the victim with the guard in the closed position.

Employers should consider providing written materials such as the single sheet flyer at the end of this report to employees using portable mortar mixers to reinforce training.

***Recommendation #3: Employers should ensure that equipment is operated according to the manufacturer's specified procedures.***

Discussion: In this case, the mixer was running with the guard in the open position while the drum and paddles were being cleaned. The operator's manual warns to "Never operate the mixer with the drum guard open or removed." It further states "The guard and guard lifter system is designed for your safety and convenience, please do not operate the mixer with the guard lifter disconnected or the guards removed." The operator's manual also instructs to "disconnect the spark plug wire when cleaning inside drum" and "Never stick your hands or any solid object into the drum while it is in operation."

***Recommendation #4: Employers should assign safety responsibilities to a competent* person at each job site.***

Discussion: In this case, the guard should have remained over the drum when the engine was running and the paddles rotating. Further, the procedures for cleaning the unit, which requires access to the inside of the drum, should only be attempted if the engine is off. Had a person been assigned safety responsibilities at the job site and enforced the safety guidelines, the incident may not have occurred.

***Recommendation #5: Employers should establish basic elements of a lock-out/tag-out program.***

Discussion: A lock out/tag out program to address hazardous energy sources, along with the methods and means to isolate them, should be provided to employees who are required to work with and around equipment (NIOSH 1999). In this case, the mixer engine should have been disabled by removing the spark plug wire as described in the operator's manual. An enforced lock out/tag out program would assure that workers are not exposed to moving machine parts. 29CFR1910.147(c)(7)(i).

***Recommendation #6: Employers should assure that all warning labels on the equipment are clearly visible and equipment is properly maintained.***

Discussion: The day of the incident, police photographed the machine. These photos did not show any warning labels on the machine. The day of the site visit, no visible warning labels were affixed to the unit. The original equipment comes with labels and the operator's manual instructs owners to call for replacement decals should the originals become defaced or destroyed and provides a toll free number for owners to request replacement decals. The unit had been re-painted between the time of the incident and the site visit and replacement decals were not in place. Warning labels provided by the manufacturer are shown in Figure 1.

***Recommendation #7: Manufacturers should consider installing a safety switch so that the engine cuts off when the guard is disconnected or removed from the drum guard lifter.***

Discussion: An interlock switch activated by disconnecting the drum guard lifter (refer to photo 2) or by lifting the guard greater than 8 inches would have stopped the rotating paddles and mitigated the immediate hazard by cutting off the engine. "An interlock switch is a device or mechanism used to connect individual components so that the action of one part of the equipment is constrained by, or dependent on, another. In general, its purpose is to prevent or interrupt the operation of machine components under specified conditions, usually when a hazard is present" (NIOSH 2003). In this case, a switch, similar to a cut off switch on a power mower, would have eliminated the hazard by not allowing the engine to rotate the paddles.

***Recommendation #8: Manufacturers should consider installing an engine kill switch on the machine.***

Discussion: An engine-kill switch mounted on the unit might have allowed the painter to stop the machine quickly. An engine-kill button mounted where it is easily accessible, visible and clearly labeled, would allow a quick method of stopping the blade movement.

## REFERENCES

29 CFR 1926.21 (b)(2) Code of Federal Regulations, Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.

NIOSH [1999] Preventing Worker Deaths from Uncontrolled Release of Electrical, Mechanical, and Other Types of Hazardous Energy. 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. 1999-110. Also see NIOSH website at http://www.cdc.gov/niosh/99-110.html.

29 CFR 1910.147(c)(7)(i) Code of Federal Regulations, Washington, D.C.: U.S. Government Printing Office, Office of the Federal Register.

NIOSH [2003] Preventing Deaths and Injuries While Compacting or Baling Refuse Material. 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. 2003-124. Also see NIOSH website at http://www.cdc.gov/niosh/2003-124.html.

## INVESTIGATOR INFORMATION

This investigation was conducted by Tim Struttmann, Associate Service Fellow and Robert Koedam, Section Chief, with the assistance of Virgil Casini, Team Leader, for the Fatality Assessment and Control Evaluation Team, Surveillance and Field Investigations Branch, Division of Safety Research.


*Figure 1. Manufacturer's Warning labels*

# Attention
# Portable Mortar Mixer Users

At a residential construction site in the spring of 2003, an 18 year old laborer who was cleaning a portable mortar mixer got caught in the machine. The rotating paddles pulled his body into the drum and he was killed. This tragedy could have been prevented. Remember…….

- Always keep the drum guard in place while the machine is running
- Do not try to operate this machine unless you have been trained it its operation
- Keep hands, clothing, jewelry away from the rotating blades
- Disconnect the spark plug before cleaning

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