

NJ FACE INVESTIGATION REPORT



Fatality Assessment & Control Evaluation Project

FACE 03-NJ-021

February 20, 2004

Hispanic Quarry Supervisor Struck by Machine Part During Maintenance

On March 29, 2003, a 44-year-old Hispanic stone quarry supervisor was killed when he was struck by a machine part while servicing a rock crushing machine. The victim and two workers were working during the weekend when the quarry was shut down. They were working on a rock crusher, a large machine that produced gravel by crushing rocks that had been blasted from the side of the quarry. On this day, the crew was making an adjustment to the crusher that would change the size of the crushed rock. This required taking off a retaining clamp and removing a large metal shim that determined the size of the crushed rock that the machine produced. The machine had been shut down, and it was quiet enough for the crew to talk easily to each other. The victim was standing under the shim assembly as his co-worker removed the two large nuts that held down the retaining clamp. As he loosened the second nut, the worker felt something was wrong and asked the victim if he should continue. The victim said to continue, and the worker removed the last bolt, releasing a 1,000 pound machine part. It struck the victim on the head, killing him instantly. NJ FACE investigators recommend following these safety guidelines to prevent similar incidents:

- **Employers should develop, implement, and enforce written procedures for servicing machinery.**
- **Employers should conduct a job hazard analysis of all work activities with the participation of the workers.**
- **Employers should consider providing written signs and training materials in the native language of their employees.**



NJ Department of Health & Senior Services
Occupational Health Service
PO Box 360, Trenton NJ 08625-0360
(609) 984-1863



INTRODUCTION

On April 10, 2003, New Jersey FACE staff received a newspaper article regarding a worker who was killed while servicing a rock crushing machine. A FACE investigator contacted the company and arranged to conduct an investigation, which was done on May 2, 2003. During the visit, the FACE investigators interviewed the company safety officer and photographed the incident site. The victim's co-workers were also interviewed through a Spanish interpreter. Additional information was obtained from the police and medical examiner's reports. The federal Mine Safety & Health Administration (MSHA) performed a compliance inspection of the incident and published an investigation report that was obtained through the Internet.

The victim's employer was a stone quarry that mined and processed basalt (traprock) into crushed stone products such as gravel. Much of the gravel was used in a separate asphalt plant that also operated at the quarry. The parent company has been in business for 40 years and employed about 500 union and supervisory workers, 35 of whom worked at the incident site. Three quarries were owned and operated by the company; this quarry had been purchased from another company in 1979. The company had a safety officer who enforced a comprehensive written safety and health program at the three plants. Employee safety meetings were held each week using lesson modules on different safety topics.

The victim was a 44-year-old Hispanic white male who had worked for the company for 19 years. He had been a production worker at the plant before his promotion to supervisor in January 1997. Born in Puerto Rico, his primary language was Spanish, but the employer stated that his English was very good. He was planning to retire soon and return to Puerto Rico. The victim is survived by his wife and two daughters.

INVESTIGATION

The incident occurred at a rock quarry located in a quiet rural-suburban area. The quarry mined basalt, a common, dense, fine-grained igneous rock with a dark gray color. Production began with the drilling of holes into the quarry's rock face and filling the holes with an ammonium nitrate-based explosive

compound. After blasting, the rock was collected in large industrial dump trucks and transported to the primary crushing machine that reduced the large blasted rocks into smaller pieces. This crusher was a jaw crusher that smashed rocks by compressing them between two massive steel jaws. These rocks were then conveyed to a secondary crusher, which further reduced them in size. The rocks would go through the secondary crusher several times until they reached the proper size and would fall through sizing screens. The screened gravel was sorted by size and used in the asphalt operation or sold as bulk gravel. The quarry processed about three million tons of material per year.

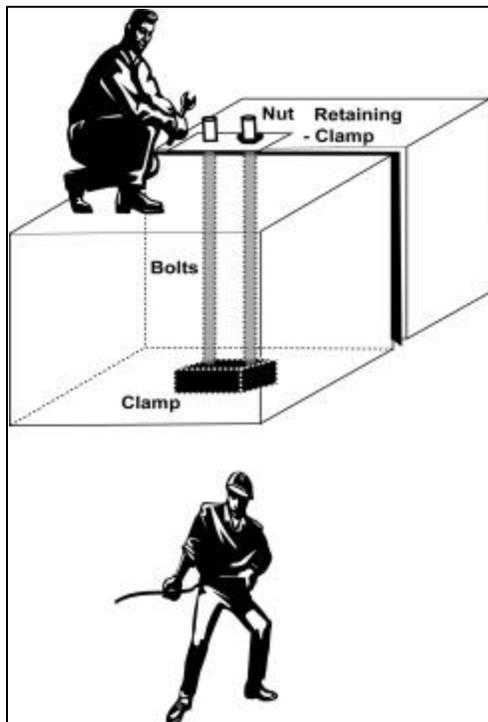


Photo 1
Primary Crusher
Arrow points to area where the incident occurred

The incident occurred on Saturday, March 29, 2003. Until this time, the plant had been closed on weekends due to the winter weather. The warmer spring temperatures allowed for the plant to reopen for its usual Saturday maintenance work. On the day before the incident, the victim started to prepare for the first day of Saturday maintenance. He planned to take a small crew out to the primary jaw crusher in order to make an adjustment. This was a 48 by 60 inch jaw crusher that had been manufactured in 1951 and updated on-site in 1984. A part had recently been replaced in the crusher, and the increased size of the new, unworn part caused a change in the size of the crushed rock. The crew's task for Saturday was to increase the size of the gap between the two crushing jaws (which

determined the size of the crushed rock) to compensate for the size of the new part. This required the removal of a large metal shim plate that set the gap between the jaws. Although there was no written procedure for the task, the victim had done it several times before and was familiar with the operation. The work was to be done on a weekend maintenance day when the quarry operations were shut down. As a result, there was no noise or other distractions to the workers.

The crew of three met on the morning of the incident and went to the crusher at 7:00 a.m. The jaw crusher was located in a large concrete building built into the side of the quarry rock face (see Photo 1). The crew included a supervisor (the victim) and two Spanish-speaking quarry workers. They climbed



Graphic 1
Diagram of Jaw Crusher
Assembly (simplified)

up several stairs and ladders to a walkway leading to the jaw crusher. Acting on the victim's instructions, one worker went to a section of the jaw crusher located above a conveyor belt. The victim stood on the conveyor belt directly below the worker. The first worker started to loosen two large nuts securing a metal plate (toggle block retaining clamp) over the opening where the shim plates were positioned (see Graphic 1). Each nut mated with a 3-inch-diameter bolt that extended down into the jaw crusher and connected with a large metal clamp block at the bottom (see Graphic 2). Sometime after 7:30 a.m. the crew started work on the machine. As the worker removed the first nut on the retaining clamp, the victim prepared the work area under the jaw crusher with the help of the second worker.

The first worker started to remove the second nut but felt that something was wrong. He told the victim this and asked if he should continue, and the victim said to go ahead. When he removed the last nut, the two unrestrained bolts attached to the clamp slipped through the machine and out the bottom. The victim, who was wearing a hard hat, was standing directly under the clamp preparing a hand-held drop light when he was struck on the head by the 1,000 pound metal clamp and bolt assembly (see Graphic 1) and killed instantly. His co-workers immediately called

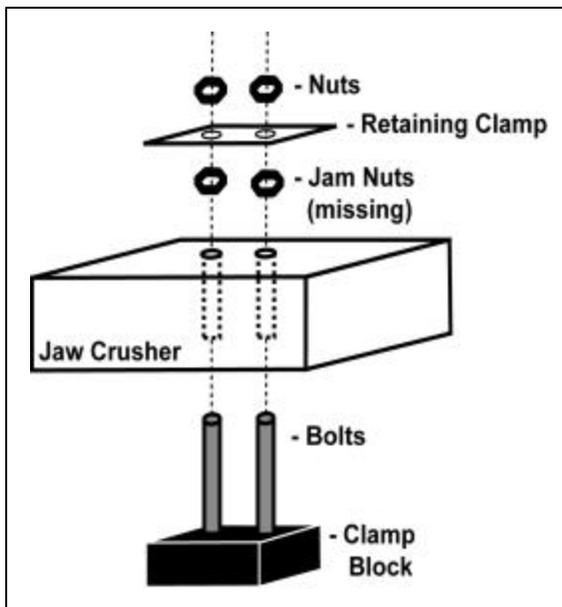
911 and waited for the police. The police and the Emergency Medical Service arrived and found that the victim had expired. They contacted the county Medical Examiner, who pronounced the victim dead at the scene at 8:32 a.m.



Photo 2
Top of Jaw Crusher Showing Toggle Block Retaining Clamp, Nut, and Wrench



Photo 3
Retaining Clamp Assembly Showing Bolts Projecting From Top



Graphic 2
Exploded Diagram of Clamp Block Assembly (simplified)

During the FACE investigation, the employer’s safety supervisor explained that the retaining clamp bolts were usually held with two sets of nuts: one set that secured the retaining clamp and a second set of “jam” nuts under the clamp that served to hold the whole retaining clamp assembly in place (see Graphic 2). In 2002, the victim supervised a repair of the machine to replace the 3-inch-diameter bolts. When the retaining clamp was reassembled, the second set of jam nuts was not installed. Only one set of nuts was used to fasten the retaining clamp, and these nuts were placed over the retaining clamp. As the nuts were removed, the weight of the assembly pulled the bolts down as the last nut was loosened. This is likely what the co-worker noticed and

asked the victim about as he loosened the nuts. The victim may have thought that the jam nuts were in place and told him to go ahead with removal of the last retaining clamp nut.

MSHA Investigation

The Mine Safety and Health Administration was notified and initiated an investigation of the incident the same day. Their investigation report notes some important details related to the servicing of the rock crusher and how it contributed to the incident:

1. In 1983-84, the crusher was repaired after a cast section of the toggle block retaining clamp assembly broke off. At that time, the machine manufacturer provided instructions for upgrading the clamp assembly as it was repaired. Modifications included adding the “jam” nuts to retain the top of the assembly and increasing the length of the 3-inch diameter bolts from 54 inches to 60 inches to allow for the additional space needed for the new nuts and hardware. The repair and modifications were successfully completed by quarry personnel.
2. In November 2002, the 3-inch-diameter bolts on the clamp assembly were replaced after they had become bent. During the repair, the old bolts were driven out of the bottom clamp and replaced with two bolts of different lengths, 54 and 60 inches respectively. MSHA noted that the “replacement bolts did not provide sufficient length and thread area for installation of the jam nuts.”
3. Once the top retaining clamp was fastened, the location where the jam nuts would normally be installed was blocked from view.

RECOMMENDATIONS/DISCUSSIONS

Recommendation #1: Employers should develop, implement, and enforce written procedures for servicing machinery.

Discussion: In this incident, the victim was directing a job that was routine but was not outlined in writing. During this operation, the crew did not support the assembly with a wooden brace as they had during previous work on this machine. Also, during the replacement of the bent bolts, only one set of

nuts were used to secure the retaining clamp. These were critical changes in procedure that resulted in the clamp being released when the nuts were removed. NJ FACE recommends that the employer develop standard written operating procedures for servicing machinery. This would include a lock-out / tag-out program to de-energize the machine, detailed instructions for the service, and a checklist to ensure that all the parts were properly replaced. Most of this information may be in the manufacturer's service manual for the machine. Should the maintenance be beyond the expertise of the employees, the employer should contract with a maintenance service.

The employer stated during the FACE investigation that, after the incident, they designed and welded a permanent metal brace to the assembly to prevent its falling through the machine.

Recommendation #2: Employers should conduct a job hazard analysis of all work activities with the participation of the workers.

Discussion: To prevent incidents such as this, NJ FACE recommends that employers conduct a job hazard analysis of all work areas and job tasks with the employees. A job hazard analysis should begin by reviewing the work activities that the employee is responsible for and the equipment that is needed. Each task is further examined for mechanical, electrical, chemical, or any other hazard the worker may encounter. The results of the analysis can be used to design or modify a written standard operating procedure or employee job description. Additional information on conducting a job hazard analysis is included in the Appendix.

Recommendation #3: Employers should consider providing written signs and materials in the native language of their employees.

Discussion: Language was not a factor in this incident since the supervisor and workers were all fluent in Spanish. However, to prevent potential problems with language, NJ FACE recommends providing written signs, procedures, and training materials in the native language of the workers.

RECOMMENDED RESOURCES

It is extremely important that employers obtain accurate information on health, safety, and applicable

OSHA standards. NJ FACE recommends the following sources of information that should help both employers and employees:

U.S. Department of Labor, MSHA

Federal MSHA regulates safety and health in metal and non-metal mines. The MSHA website has a great deal of useful safety and health information including detailed reports on fatality investigations. New Jersey mines are under the jurisdiction of the Wyomissing PA field office.

☎ Telephone: (610) 372-2761

🌐 Website: www.msha.gov

U.S. Department of Labor, OSHA

Federal OSHA will provide information on safety and health standards on request. OSHA has several offices in New Jersey that cover the following counties:

☎ Hunterdon, Middlesex, Somerset, Union, and Warren counties.....(732) 750-3270

☎ Essex, Hudson, Morris, and Sussex counties.....(973) 263-1003

☎ Bergen and Passaic counties.....(201) 288-1700

☎ Atlantic, Burlington, Cape May, Camden, Cumberland, Gloucester,

Mercer, Monmouth, Ocean, and Salem counties.....(856) 757-5181

🌐 Federal OSHA Website: www.osha.gov

NJ Public Employees Occupational Safety and Health (PEOSH) Program

The PEOSH act covers all NJ state, county, and municipal employees. Two state departments administer the act; the NJ Department of Labor (NJDOL), which investigates safety hazards, and the NJ Department of Health and Senior Services (NJDHSS), which investigates health hazards. PEOSH has information that may also benefit private employers.

NJDOL, Office of Public Employees' Occupational Safety & Health

☎ Telephone: (609) 633-3896

🌐 Website: www.nj.gov/labor/lse/lspeosh.html

NJDHSS, Public Employees Occupational Safety & Health Program

☎ Telephone: (609) 984-1863

🌐 Website: www.state.nj.us/health/eoh/peoshweb

NJDOL Occupational Safety and Health On-Site Consultation Program

Located in the NJ Department of Labor, this program provides free advice to private businesses on improving safety and health in the workplace and complying with OSHA standards.

☎ Telephone: (609) 984-0785

🌐 Website: www.nj.gov/labor/lse/lsonsite.html

New Jersey State Safety Council

The NJ State Safety Council provides a variety of courses on work-related safety. There is a charge for the seminars.

☎ Telephone: (908) 272-7712.

🌐 Website: www.njsafety.org

Internet Resources

Other useful internet sites for occupational safety and health information:

www.cdc.gov/niosh - The CDC/NIOSH website.

www.dol.gov/elaws -USDOL Employment Laws Assistance for Workers and Small Businesses.

www.nsc.org - National Safety Council.

www.state.nj.us/health/eoh/survweb/face.htm - NJDHSS FACE reports.

www.cdc.gov/niosh/face/faceweb.html - CDC/NIOSH FACE website.

REFERENCES

1. *Job Hazard Analysis*. US Department of Labor Publication # OSHA-3071, 1998 (revised). USDOL, OSHA/OICA Publications, PO Box 37535, Washington DC 20013-7535.

DISTRIBUTION LIST

Immediate Distribution

MSHA

NIOSH

Employer

Labor Union(s)

NJ State Medical Examiner

County Medical Examiner

Local Health Officer

NJDHSS Occupational Health Service Internet Site

NJDHSS Census of Fatal Occupational Injuries (CFOI) Project

General Distribution

USDOL-OSHA New Jersey Area Offices (4)

NJDOL Office of Public Employees Safety

NJDHSS Public Employees Occupational Safety & Health Program

NJDOL OSHA Consultative Service

NJ Institute of Technology

University of Medicine & Dentistry of NJ

Rutgers University

Stevens Institute of Technology

NJ Shade Tree Federation

NJ Utilities Association

NJ School Boards Association

Public Service Electric and Gas Company

Liberty Mutual Insurance Company Research Center

Private Consultants (1)

Private Employers (2)

Public Employers (2)

Other Government Agencies (1)

Fatality Assessment and Control Evaluation (FACE) Project
Investigation # 03-NJ-021

Staff members of the New Jersey Department of Health and Senior Services, Occupational Health Service, perform FACE investigations when there is a report of a targeted work-related fatal injury. The goal of FACE is to prevent fatal work injuries by studying the work environment, the worker, the task and tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact. FACE gathers information from multiple sources that may include interviews of employers, workers, and other investigators; examination of the fatality site and related equipment; and review of OSHA, police, and medical examiner reports, employer safety procedures, and training plans. The FACE program does not seek to determine fault or place blame on companies or individual workers. Findings are summarized in investigation reports that include recommendations for preventing similar events. All names and other identifiers are removed from FACE reports and other data to protect the confidentiality of those who participate in the program.

NIOSH-funded state-based FACE Programs include: Alaska, California, Iowa, Kentucky, Massachusetts, Michigan, Minnesota, Nebraska, New Jersey, New York, Oklahoma, Oregon, Washington, West Virginia, and Wisconsin. For further information, visit the NJ FACE website at www.state.nj.us/health/eoh/survweb/face.htm or the CDC/NIOSH FACE website at www.cdc.gov/niosh/face/faceweb.html.

Patrick Bost, M.S.
FACE Principal Investigator
Occupational Health Surveillance Program

Emily O'Hagan, R.N., M.P.H.
FACE Investigator
Occupational Health Surveillance Program

Daniel Lefkowitz, Ph.D.
FACE Investigator
Occupational Health Surveillance Program

Barbara Gerwel, M.D.
Project Coordinator
Occupational Health Surveillance Program

Donald Schill, M.S., CIH
Research Scientist
Occupational Health Surveillance Program

David Valiante, M.S., CIH
Program Manager
Occupational Health Surveillance Program

Gary Ludwig, M.S.
Acting Director
Occupational Health Service

Eddy A. Bresnitz, M.D., M.S.
Senior Assistant Commissioner /
State Epidemiologist, Division of Epidemiology
Environmental, and Occupational Health

