MAI-2003-6

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Traprock)

Fatal Hand Tools Accident
March 29, 2003

Stavola Constr. Materials, Inc.
Stavola Constr. Materials, Inc.
Bridgewater, Somerset County, New Jersey
Mine I.D. No. 28-00015

Investigators

James S. Hull
Supervisory Mine Safety and Health Inspector

Robert A. Dow Jr.
Mine Safety and Health Inspector

Rich Skrabak
Mechanical Engineer

Elsa A. Montoya
Mine Safety and Health Specialist

Originating Office
Mine Safety and Health Administration
Northeast District
547 Keystone Drive, Suite 400
Warrendale, Pennsylvania 15086
James R. Petrie, District Manager

OVERVIEW

Ruben Cotto, supervisor, age 44, was fatally injured on March 29, 2003, when he was struck by the shim block rest assembly of the jaw crusher**.** Cotto was performing adjustments to the crusher's shims and was positioned below the shim block rest assembly while two other employees loosened the nuts on the support rods located on top of the crusher. When the nuts were removed, the assembly unit fell, crushing Cotto.

The cause of the accident was the failure to block the shim unit against hazardous motion prior to removing the nuts. A contributing factor to the accident was failure to replace the locking jam nuts on the crusher's two toggle block rest retainer bolts when a maintenance procedure to replace bent bolts was conducted in November 2002.

GENERAL INFORMATION

Stavola Construction Materials Inc., a surface quarry, owned and operated by Stravola Construction Materials Inc., was located at 810 Thompson Rd., Bridgewater, Somerset County, New Jersey. The principal operating officials were Frank Stavola Sr., president, Dean S. Myers, corporate safety manager, and Mark Pfaff, quarry superintendent. The mine normally operated one 8-hour shift per day, 5 days a week. A plant maintenance shift was conducted from 7:00 a.m. to 12:00 p.m. on Saturdays. Total employment was 37 persons.

Trap rock was drilled and blasted from multiple benches in the quarry. The blasted rock was loaded into trucks with front-end loaders and transported to primary crushers. Additional sizing of the rock was conducted through secondary crushers and screen decks. The finished product was primarily used for asphalt production at the company owned asphalt plants and was also sold for use in construction projects.

The last regular inspection at this mine site was completed on September 19, 2002. Another regular inspection was conducted following this investigation.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, Ruben Cotto (victim) reported for work at approximately 6:56 a.m. He met with Gerado Cruz and Alex Murillo Fletes, laborers, to inform them that they would be assisting him in adjusting the shims in the Traylor Jaw Crusher. Cotto instructed Fletes to gather tools and report to the south side crusher with Cruz. The men arrived at the crusher shortly after 7:00 a.m. Cruz and Fletes loosened the toggle rod bolts of the shim unit by removing the nut on the left side toggle block retainer bolt, and loosened the right side nut to the top of the threads. Cruz then cleaned the exposed threads of the toggle block retainer bolts that extend out of the toggle block retainer clamp. During this time, Cotto accessed the lower area of the shim unit by using a ladder that was placed under the crusher, between the toggle rods at the second level landing, and on the conveyor belt surface of the C-33 jaw discharge conveyor. Cotto checked the welds on the bottom of the toggle retainer bolts where they make contact with the bottom plate.

Cotto called up to Cruz and told him to get a drop light and extension cord to help illuminate the shim unit and area under the crusher. Fletes then called down to Cotto and asked if everything looked okay. Cotto replied positively, and instructed Fletes to remove the remaining top nut on the right side retainer bolt. When the nut was removed, the retainer bolts pulled through the crusher causing the toggle block rest assembly and retainer bolts of the shim unit to fall, striking Cotto in the head.

Mark Pfaff, quarry superintendent, and Thor Bower, crusher operator, were working at the south plant approximately 50 feet away and heard Fletes yell to call 911. Pfaff and Bower responded to the accident scene immediately. A call was placed to local emergency personnel. Bower found the shim unit on top of Cotto and pushed on the upright retainer bolts to move it. Fletes pulled Cotto backward by the lower torso. Bower checked for vital signs and none were found.

The local police department responded to the scene along with paramedics who were unable to detect any vital signs. The victim was pronounced dead at the scene. Death was attributed to multiple blunt force injuries.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 9:00 a.m., on March 29, 2003, by a telephone call from Mark Pfaff, quarry superintendent, to James Petrie, northeast district manager. An investigation was started the same day. An order was issued pursuant to section 103(k) of the Mine Safety and Health Act to ensure the safety of the miners. MSHA's accident investigation team traveled to the mine, conducted a physical inspection of the accident scene, interviewed employees, and reviewed documents and work practices and procedures relevant to the accident. The accident investigation was conducted with the assistance of mine management, employees, and representatives of the crusher manufacturer.

DISCUSSION

Location of the Accident

The accident occurred at the south jaw crusher located in the quarry.

This jaw crusher (south crusher) was a Traylor Jaw Crusher, model 48 inch by 60 inch, serial number 57305, and was manufactured in 1951. The crusher was updated in 1985.

Crusher shim unit (toggle rod bolts/toggle block)

The shims on the crusher were routinely adjusted by replacing or removing them. The purpose of the adjustments was to regulate the size of the crushed material. The toggle block rest assembly main bottom plate was 27 inches long, 18 inches wide, and 4 inches thick. Two steel wing gussets were attached to the plates' rear shelf with a space of 12 inches between them. The wing gussets measured ¾" thick, 6 inches long, and 10 inches high. The added top plate rest area measured 6 inches by 22 inches. The portion of the shim unit that fell was the toggle block rest and bolt assembly, weighing approximately 1,000 pounds.

In late 1983 or early 1984, a cast section of the south crusher's toggle block rest assembly broke off. This cast section supported the toggle block and shims. On January 11, 1984, a product engineer from the crusher manufacturer supplied the mine operator with detailed drawings and instructions to replace the broken cast block rest. The instructions included two drawings with dimensions for the new toggle block rest and requirements to modify the existing top toggle block retainer clamp to allow the locking jam nuts space to be properly installed. The design of the toggle block support shelf was modified with additional gussets and top plates, to allow the toggle block and shims to rest on the shelf. It is believed this modification was done during initial installation of this shelf in 1984. The instructions stated that the threaded area of the two, 3-inch diameter retainer bolts would have to be increased to allow for the jam nuts.

The original 3-inch diameter toggle retainer bolts on the south side crusher were 4 feet 6 inches long with a threaded area covering the first 7 inches. Because of the additional height required to go through the 4-inch base of the toggle block support shelf, the new bolts had to be 5 feet long. The locking jam nuts were to be installed on the bolts under the toggle block retainer top clamp. To do this, the new retainer bolts required a threaded area of 19 inches.

The two retainer bolts for the toggle block rest assembly were 3 inches in diameter, with UNC coarse threads (4 threads per inch). The purpose of the jam nuts on the underside of the toggle block retainer top clamp was to keep the toggle block support shelf and bolts from falling when the two additional bolts on the top of the clamp were removed. The top nuts and the toggle block retainer clamp were required to be removed so the toggle block and shims were loose enough to add or remove the spacer shims for the crusher.

Interviews revealed that in November 2002, the toggle block retainer bolts on the south side crusher had become bent and had to be replaced. The bolts were damaged by the turning of the safety toggle in its seat or position. The bottom nuts on the bolts were removed by cutting away the weld where they attach to the bottom of the toggle block rest assembly and the bolts were driven out.

The right replacement bolt that was used was 54 inches long, with 7 inches of threads. The left side bolt was 60 inches long, with 19 inches of threads. The two locking jam nuts, required to prevent the toggle block rest assembly from falling, were not replaced at the time of the retainer bolt replacement. The replacement bolts did not provide sufficient length and thread area to allow for installation of the jam nuts. The location of the locking nuts for the retainer bolts was blocked from view once the top retainer clamp was installed.

Shim unit adjustment procedures

The jaw discharge conveyor located under the south crusher was 48 inches wide. The distance from the conveyor belt surface to the crusher frame above was 88 ½ inches.

Cotto was positioned on this discharge conveyor below the crusher frame to check the condition of the welded nuts on the lower end of the retainer bolts and to monitor the loosening of the bolts to pull out the shims. A Dayton, 1 ½-ton capacity, 1 ½-inch chain, ratchet type, come-a-long was observed near the area where Cotto was working**.** The come-a-long was normally used to hook to a clevice in place at the rear of the crusher frame's underside and the swing jaw, to pull the swing jaw forward to remove the shims.

To add or remove a shim, the tension rods must be loosened and the swing jaw moved towards the front of the crusher. The toggle block retainer clamp must be removed so shims can be removed.

Training

Cotto had 19 years mining experience, all with Stavola Materials. He had received task training from a former crusher operator Ben Montini, who was employed at this operation from 1989 to

1994. (An interview with Montini revealed that a blocking device or plate was always used as a safety precaution to block the shim rest assembly during adjustments on the unit when he and Cotto had performed this task.)

Fletes was hired by Stavola Construction Materials Inc. in September 2002. He did not receive experienced miner training. Cotto had given Fletes some task training for the job he was doing; however, the training was found to be incomplete and was not documented. Flete's regular job was a laborer, but he had assisted with the shim unit adjustments in the past.

Cruz was hired at this mine in 1999. His regular job was a laborer and focused mainly on clean up duties at the mine. The mine operator indicated that Cruz had received task training, but no documentation was available.

ROOT CAUSE ANALYSIS

A root cause analysis was conducted and the following causal factors were identified:

Causal Factor: The shim unit was not blocked against hazardous motion prior to beginning adjustments. Written procedures for this maintenance task were not established to ensure hazards were discussed and personnel were trained in safe work procedures.

Corrective Action: A maintenance procedure should be developed that addresses actions to be taken while performing work on the shim units of the crushers. The procedure should be documented and reviewed with all persons that participate in the task. The procedures should ensure that the proper equipment is utilized and all components are secured against hazardous motion.

Causal Factor: During November 2002, the toggle block retainer bolts on the south crusher had become bent and were replaced. The right replacement bolt used was 54 inches long, with 7 inches of threads. The left side bolt was 60 inches long, with 19 inches of threads. The two locking jam nuts required to prevent the toggle block rest assembly from falling were not installed at the time of the retainer bolt replacement. The right replacement bolt did not provide sufficient length and thread area to allow for installation of the retainer bolts.

Corrective Action: All replacement parts should be within the manufacturer's designed specifications. A planned maintenance reporting program that requires formal documentation of any prior specific maintenance activities should be implemented. The report should include, and readily identify, any changes to the manufacturer's designed specifications. This process, if in place prior to this activity, would have identified the missing locking jam nuts, and served as a reminder of the need to block the unit prior to removing the top nuts.

Causal Factor: A risk assessment to identify possible hazards associated with this task had not been conducted prior to performing the job.

Corrective Action: A risk assessment should be conducted to identify potential hazardous conditions associated with maintenance tasks. Possible hazards should be discussed with all employees involved and procedures should be implemented to ensure persons are properly protected.

CONCLUSION

The cause of the accident was the failure to block the shim unit against hazardous motion prior to removing the nuts. A contributing factor to the accident was failure to replace the locking jam nuts on the crusher's two toggle block rest retainer bolts when a maintenance procedure to replace bent bolts was conducted in November 2002.

ENFORCEMENT ACTIONS

Order No. 6002361 was issued on March 29, 2003, under the provisions of Section 103(k) of the Mine Act:

> A fatal accident occurred at this operation on March 29, 2003, when a steel plate fell from a jaw crusher striking an employee working below. This order is issued to assure the safety of persons at this operation and prohibits work in the affected area until MSHA has determined that it is safe to resume normal operations as determined by an authorized representative of the Secretary of Labor. The mine operator shall obtain approval from an authorized representative for all actions to recover and/or restore operations in the affected area.

The order was terminated on April 8, 2003. The conditions that contributed to the accident no longer existed.

Citation No. 6002376 was issued on May 19, 2003, under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 56.14105:

> On March 29, 2003, a fatal accident occurred at this operation when a shim/toggle block rest assembly fell and struck a supervisor. The supervisor was working beneath the rest assembly while a helper removed two nuts from the bolts holding the rest assembly in place. When the second nut was removed, the rest assembly fell striking the victim. The rest assembly had not been blocked to prevent hazardous motion.

This citation was terminated on May 21, 2003. The mine operator installed new retaining bolts and additional safety nuts to the shim unit. Additional support gussets were welded to the rest assembly to prevent movement in the event the nuts were removed from the retaining bolts. The mine operator established a policy, and discussed procedures with all employees involving proper methods of blocking equipment and machinery during maintenance and repairs.

Citation No. 6002377 was issued on May 19, 2003, under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 46.7:

> On March 29, 2003, a fatal accident occurred at this operation when a shim/toggle block rest assembly fell and struck a supervisor. The supervisor was working beneath the rest assembly while a helper removed two nuts from the bolts holding the rest assembly in place. When the second nut was removed, the rest assembly fell striking the victim. New Task Training had not been provided to the employees assisting the victim with the task.

This citation was terminated on May 21, 2003. The mine operator provided task training to the affected employees on April 4 and 5, 2003.

Approved By: Date: July 10, 2003

James R. Petrie
District Manager

APPENDIX A

A. Persons participating in the Investigation
B. Persons Interviewed

APPENDIX A

Persons Participating in the Investigation

STAVOLA CONSTR. MATL'S.,INC.

Richard Stavola	vice president
James M. Stavola Jr.	secretary
Dean S. Myers Jr.	corporate safety manager
Mark Pfaff	quarry superintendent
Juan Berrios	maintenance foreman / miners' rep.

INTERNATIONAL UNION OF OPERATING ENGINEERS

Nunz Dagostino	local # 825, shop steward

MINE SAFETY AND HEALTH ADMINISTRATION

James S. Hull	supervisory mine safety and health inspector
Robert A. Dow Jr.	mine safety and health inspector
Richard Skrabak	mechanical engineer
Elsa Montoya	mine safety and health specialist

F.L. SMIDTH CO. / CRUSHER MANUFACTURER

Edward W. Kline	director environmental affairs / occupational safety
Michael Selinsky	field service consultant
Terry Bernini	product engineer

APPENDIX B

Persons Interviewed

STAVOLA CONSTR. MATL'S.,INC.

Mark Pfaff	quarry superintendent
Juan Berrios	maintenance foreman, miners' representative
Gerardo Cruz	laborer
Alexander Murillo Fletes	truck driver/maintenance welder
Thor Bower	north side crusher operator
Daniel Burnett	face loader operator / former crusher operator
Benito Montini	retired crusher operator
Bertram Nurse	asphalt plant operator / former crusher worker