

**UNITED STATES  
DEPARTMENT OF LABOR  
MINE SAFETY AND HEALTH ADMINISTRATION  
Metal and Nonmetal Mine Safety and Health**

**REPORT OF INVESTIGATION**

**Surface Nonmetal Mine  
(Sand and Gravel)**

**Fatal Machinery Accident  
June 17, 2005**

**Sky River Pit  
Cadman (Rock) Inc.  
Monroe, Snohomish County Washington  
Mine I.D. No. 45-03014**

**Investigators**

**Chad D. Hilde  
Mine Safety and Health Inspector**

**Ronald L. Eastwood  
Mine Safety and Health Inspector**

**Michael A. Hockenberry  
Fire Protection Engineer**

**Melvin K. Palmer  
Mine Safety and Health Specialist**

**Originating Office  
Mine Safety and Health Administration  
Western District  
2060 Peabody Road, Suite 610  
Vacaville, California 95687  
Ronald S. Goldade, Acting District Manager**

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## **OVERVIEW**

Eric Bennett, maintenance man, age 32, was fatally injured on June 17, 2005, while removing the toggle plate seat from the pitman on a jaw crusher. Bennett was standing on a temporary platform when the bolts holding the toggle seat were removed, causing the pitman to move and strike him.

The accident occurred because standards and controls had not been established to ensure the pitman was blocked against hazardous motion before the toggle seat wedge bolts were removed. No procedures were in place to ensure that Bennett received any task training to safely perform this task.

## **GENERAL INFORMATION**

Sky River Pit, a surface sand and gravel operation, owned and operated by Cadman (Rock) Inc., was located in Monroe, Snohomish County, Washington. The principal operating official was Gabe Morrelli, production superintendent. The mine operated one eight hour shift per day, five days per week. Total employment was 12 persons.

Sand and gravel was mined by a dragline and hauled to a primary crusher. The material was then conveyed to a plant where it was re-crushed, sized, and washed. The finished product was sold for industrial and commercial aggregate.

The last regular inspection at this operation was completed on March 9, 2005.

One month before the accident, the jaw crusher had been relocated about 200 yards west of its prior location. The day before the accident, Eric Bennett (victim) and Richard Berkshire, mechanic, began repairing the pitman toggle seat in the jaw crusher.

## **DESCRIPTION OF THE ACCIDENT**

On the day of the accident, Bennett reported to work at 7:00 a.m., his normal starting time. He and Berkshire rode to the crusher with Joseph Duplessis, mechanic.

Bennett and Berkshire dismantled a temporary work platform to replace it with a more substantial one. Duplessis parked the service truck nearby and strung an air line to the work site.

All three men lifted the new platform into place. Berkshire began to weld it to the frame of the crusher. Bennett climbed up the ladder, got onto the platform, and entered the area where the toggle plate had been. He took out one bolt and toggle seat wedge. After taking the remaining bolt out, Bennett set the air wrench on the crusher frame above him and yelled that he had the bolts out.

Duplessis and Berkshire returned to the work platform and found Bennett, nonresponsive, wedged between the framework and the pitman. They called Richard Conn, leadman, who requested emergency medical assistance.

Emergency medical personnel transported Bennett to a local hospital where he died the next day. Death was attributed to crushing trauma.

## **INVESTIGATION OF THE ACCIDENT**

MSHA was notified of the accident at 9:00 a.m. on June 17, 2005, by a telephone call from Steven Whitescarver, production manager, to Ronald Jacobson, mine safety and health inspector. An investigation was started the same day. An order was issued pursuant to Section 103(k) of the Mine Act to ensure the safety of the miners. MSHA's accident investigation team traveled to the mine, conducted a physical inspection of the

accident site, interviewed employees, and reviewed documents and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management, employees, and emergency personnel.

## **DISCUSSION**

### **Location of the Accident**

The accident occurred at the Nordberg jaw crusher that was being prepared for use as the primary crusher.

The weather was sunny with a temperature of about 70 degrees Fahrenheit.

### **Jaw Crusher**

The Nordberg VB Model 0806 jaw crusher was purchased new for this property in 1990. The crusher was powered by a 460-volt, 100 horsepower, electric motor that operated at 1185 revolutions per minute. The crusher was mounted on a steel beam tower with a scalping screen above the crusher feed hopper.

The dimensions of the feed opening of the crusher were 31.5 inches by 23.6 inches. The crusher jaws were set in an open-bottomed "V"; one jaw fixed to the frame, while the movable jaw was pivoted to swing from its top edge. Under power, the movable jaw was driven toward the fixed jaw to impose a crushing force. The movable jaw then moved back to allow the material to drop further into or through the gap.

Both fixed and movable jaws consisted of one jaw plate made of manganese steel. The movable jaw bolted to the pitman and was equipped with an upper pitman cover plate. The movable jaw weighed 2,471 pounds and the pitman weighed 4,751 pounds, totaling 7,222 pounds.

### **Pitman Cylinder Pump**

The crusher was equipped with an electric pump and hydraulic jack mounted to the frame. The manufacturer had installed this unit to push the pitman forward so that safety pins could be installed in the holes provided to block the pitman from movement.

### **Toggle Plate and Toggle Plate Seats**

The toggle plate was the pivot point for the pitman, and, in conjunction with the eccentric shaft, generated the crushing motion of the movable jaw against the stationary jaw. The toggle plate had beveled or rounded ends and rested between the pitman toggle seat and the adjustable toggle seat which were grooved to receive the toggle plate.

The pitman toggle seat measured 27 inches by 5 inches by 3 inches. It had been previously modified by cutting about 3 inches from the right end. The pitman toggle seat was designed to be secured to the rear of the pitman by four toggle seat wedges. However, on the day of the accident, only two wedges secured the pitman toggle seat to the pitman. The other two wedges were missing and the bolts appeared to have been sheared off during operation of the crusher.

Examination of the pitman toggle seat revealed that the left side (drive side) was striking and eroding the left side of the crusher structure resulting in an approximate 3/4-inch gouge in the steel side wall. There was an identical gouge on the right side of the structure. Both right side and left side markings on the steel plating matched the shape of the ends of the pitman toggle seat.

### **Eccentric Shaft, Pitman, and Flywheel**

The eccentric, lobed shaft provided motion to the pitman and movable side jaw. It had four positions depending on the direction that the lobe was facing: up, down, forward, and back. The pitman extended down from the eccentric shaft to the bottom of the crusher frame. The pitman's center of gravity caused it to rest on the stops provided to close the gap left by the removed toggle seat. The position of the lobed shaft and flywheel did not change the center of gravity of the pitman.

### **Maintenance Procedures and Other Factors**

The victim accessed the work area via scaffolding that was spot welded between two I-beams within the crusher framework. The scaffolding walkway was 12 feet long and 2 feet wide. The scaffolding deck was 91 inches above the concrete slab and approximately 63 inches to the pitman toggle seat.

When the crusher had to be accessed for maintenance, the workers connected the pitman cylinder (hydraulic ram) to the mounting bracket on the rear of the pitman. They would then extend the pitman cylinder with the hydraulic pump. This action freed the toggle plate and provided access to the pitman toggle seat.

The pitman could be safely blocked from movement in this position by inserting pitman hold pins into the two holes on either side of the crusher. During the accident investigation, two pitman hold pins were found on the mine site.

During the time of the accident, the lack of electrical power to the crusher prevented the workers from using the pitman cylinder to close the pitman. Instead, the victim and co-worker moved the pitman on the day prior to the accident with a 10-ton capacity, hydraulic, Porto-power hand pump. This enabled them to remove the toggle plate. The Porto-power hand pump was also removed and the flywheel was turned one revolution by hand. Reportedly, the workers assumed that by turning the flywheel the pitman would swing to its resting position and contain zero potential energy.

At the time of the accident, however, the pitman toggle seat was protruding approximately 3 inches outside its normal position, and was caught in the edge of the left side gouge. This prevented the pitman from swinging to its typical resting position.

Once the victim removed the toggle seat wedges, the pitman toggle seat was no longer secured to the pitman, allowing the pitman toggle seat to slide laterally to the right removing the edge from the left side gouge. When the pitman toggle seat slid, nothing prevented the pitman from swinging back to its resting position and striking the victim.

There was approximately 16 inches of accessible work space when the pitman was supported properly by the two safety pins. Without the safety pins installed, the pitman rested against stops. In this position, there was about 6 inches to 8 inches of space between the pitman and the crusher structure. Using these measurements, investigators estimated that the pitman swung approximately 8 to 10 inches during the accident.

Nordberg's Jaw Crusher Instruction Manual provided a fourteen step procedure for removal of the toggle plate and toggle plate seats. Step eight described the insertion of a safety pin through the side frame of the crusher to prevent the pitman from moving back against the stops. Two copies of this manual were available at the mine.

### **Training and Experience**

Eric Bennett had a total of five years of mining experience, eleven months at this mine. He had received training in accordance with 30 CFR, Part 46. Bennett did not have any prior experience, nor had he received any training to safely perform this task.

Richard Berkshire had performed this same task in 2000; however, he had not received any training specific to this task. The manufacturer's instruction manual was not provided to the crusher repair crew.

## **ROOT CAUSE ANALYSIS**

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

Causal Factor: Management policies, standards, and controls were inadequate. Procedures were not in place to ensure that the pitman was blocked against hazardous motion before the toggle seat wedge bolts were removed.

Corrective Action: Management should develop and implement procedures that ensure repairs to the jaw crusher do not expose miners to hazards. Perform a thorough risk assessment before starting a task to ensure that all hazards are controlled or eliminated. These procedures should include the manufacturer's recommendations regarding the insertion of a safety pin through the side frame of the crusher to prevent movement of the pitman.

Causal Factor: Standards and controls were inadequate. No task training was provided to the miners regarding the removal of the toggle seat on the jaw crusher to make them aware of the health and safety aspects of the task.

Corrective Action: Management should task train miners before assigning them tasks in which they have no previous work experience. This training should include procedures and safety devices recommended by the manufacturer.



## CONCLUSION

The accident occurred because the pitman was not blocked against hazardous motion before the toggle seat wedge bolts were removed. No procedures were in place to ensure that the task could be completed safely. Task training had not been conducted.

## VIOLATIONS

Order No. 6363501 was issued on June 17, 2005, under the provisions of Section 103(k) of the Mine Act:

A fatal accident occurred at this operation on June 17, 2005, when three maintenance personnel were disassembling a Nordberg model No. 0806 jaw crusher. This order is issued to ensure the safety of all persons at this operation. It prohibits all activity at the Nordberg jaw crusher area until MSHA has determined that it is safe to resume normal mining operations in the area. The mine operator shall obtain prior approval from an Authorized Representative for all actions to recover and/or restore operations to the affected area.

This order was terminated on July 12, 2005. The conditions that contributed to the accident have been corrected and normal mining operations can resume.

Citation No. 6376232 was issued on July 13, 2005, under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 56.14105:

A fatal accident occurred at this mine on June 17, 2005, when a maintenance man was removing a toggle seat on a Nordberg model 0806 jaw crusher. The pitman and movable side jaw swung back and struck the victim as the last toggle seat wedge bolt was removed. The operator did not utilize the integral securing method and feature provided by the manufacturer nor otherwise provide a method for miners to adequately block the machinery component against motion.

This citation was terminated on July 18, 2005. The integral securing method and feature provided by the manufacturer will be used for future repairs to the crusher, eliminating the hazard.

Citation No. 6376233 was issued on July 13, 2005, under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 46.7a:

A fatal accident occurred at this mine on June 17, 2005 when a miner was removing a toggle seat on the Nordberg model 0806 jaw crusher. The pitman and movable side jaw swung back and struck the victim as the last toggle seat wedge bolt was removed. The task was a new one for this miner who had no previous work experience with this task. The operator did not train the miner in the safe work procedures for such task prior to undertaking the task, including but not limited to failing to instruct him to

utilize the integral securing method and feature provided by the manufacturer and failing to review the step by step instructions provided by the manufacturer for this task.

This citation was terminated on July 18, 2005. The mine operator implemented new training policies and procedures to ensure that miners performing maintenance tasks receive training before they begin the task.

Approved By:

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Ronald S. Goldade  
Acting District Manager

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Date

**APPENDIX**  
**Persons Participating in the Investigation**

Cadman (Rock) Inc.

Gabriel Morrelli	production superintendent
Steven Whitescarver	production manager
Max Agoff	production engineer

Lehigh/Heidelberg Cement Group

Bob Jakubec	human resources manager
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Jackson and Kelly

Katherine Shand Larkin	attorney
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City of Monroe Fire Department

Jamie Silva	fire chief
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City of Monroe Police Department

Timothy Buzzell	detective
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Mine Safety and Health Administration

Chad D. Hilde	mine safety and health inspector
Ronald L. Eastwood	mine safety and health inspector
Michael A. Hockenberry	fire protection engineer
Melvin K. Palmer	mine safety and health specialist