MAI-2007-30

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

REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Limestone)

Fatal Handtools Accident
October 24, 2007

Delphi Limestone Company
US Aggregates, Inc.
Delphi, Carroll County, Indiana
Mine I.D. No. 12-00023

Investigators

Stephen W. Field
Mine Safety and Health Specialist

Phillip L. McCabe
Mechanical Engineer

Originating Office
Mine Safety and Health Administration
North Central District
515 West First Street, Room 333
Duluth, MN 55802 – 1302
Steven M. Richetta, District Manager

OVERVIEW

Samuel M. Kemp, assistant superintendent, age 36, was injured on October 24, 2007, while removing a loader bucket tooth lodged in a crusher. He was struck by material that had been placed on top of jacks in an attempt to free the tooth. Kemp was hospitalized and died of his injuries on October 29, 2007.

The accident occurred because management procedures and controls were inadequate and failed to ensure that persons could safely remove objects blocking the crusher. The manufacturer's procedures for removing objects blocking the crusher were not followed.

GENERAL INFORMATION

Delphi Limestone Company, a surface limestone operation, owned and operated by US Aggregates, Inc., was located in Delphi, Carroll County, Indiana. The principal operating official was James C. Fehsenfeld, director/president. The mine normally operated two, 10-hour shifts per day, five days a week. Total employment was 28 persons.

Limestone was drilled, blasted, and mined with hydraulic shovels. Haulage trucks transported the material to the primary crusher in the quarry. Material was then conveyed to the main plant where it was further crushed, screened, and washed. The finished products were sold for use as construction aggregate.

The last regular inspection of this operation was completed on June 27, 2007.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, Samuel M. Kemp (victim) reported for work at 6:00 a.m., his normal starting time. About 8:00 a.m., the cone crusher plugged and stopped, burning off the drive belts. Kemp, Eric J. Randle, quality control technician, and Bryon L. Nipple, plant crusher operator, installed new drive belts. Kemp, Jon E. Riley, plant crusher operator, and Forrest E. Eiler, primary plant operator, cleaned out the crusher and found a steel tooth from a front-end loader bucket lodged in it.

Kemp and Riley placed a 100-ton jack on the outside of the crusher framework and tried to extend the reach of the jack by placing a 2 7/16-inch diameter by 27 1/2-inch long steel tail pulley shaft and several pieces of steel plate on top of the jack. They unsuccessfully attempted to raise the crusher's upper section to dislodge the tooth. Kemp and Riley then put a 50-ton jack near the 100-ton jack and extended the reach by placing a 2 7/16-inch diameter by 31 3/8-inch long round steel tail pulley shaft on top of the jack. They placed a chain in front of the steel shafts in an attempt to prevent movement. The upper section would not raise using the two jacks.

Kemp and Riley were able to raise the upper section after placing a 30-ton jack by the 50-ton jack and a 30-ton jack next to the 100-ton jack. The tooth still remained lodged in the crusher so Kemp instructed Nipple to use a torch to cut it out. About 4:00 p.m., the tooth was removed and Eiler released the 30-ton jack adjacent to the 50-ton jack. Kemp was about to release the other 30-ton jack when the remaining jacks suddenly kicked out. Kemp was struck by material placed on top of the jacks.

Coworkers immediately attended to Kemp. Emergency medical personnel arrived and transported the victim to a hospital where he died on October 29, 2007. The cause of death was attributed to traumatic injury.

INVESTIGATION OF THE ACCIDENT

The Mine Safety and Health Administration (MSHA) was notified of the accident on October 24, 2007, by a telephone call from Larry Harshbarger, corporate safety director, to MSHA's National Call Center. Gerald D. Holeman, assistant district manager, was called and an investigation began the same day.

MSHA's investigation team traveled to the mine, conducted a physical inspection of the accident site, interviewed mine employees, and reviewed documents and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management, employees, and the miners' representative.

DISCUSSION

Location of the Accident

The accident occurred at the crushing and screening plant. The ground around the plant was fairly level and dry.

Crusher

The 5½-foot-diameter cone crusher was manufactured by Nordberg Symons. The crusher's stationary housing consisted of two main sections, a lower main frame and an upper bowl held together by bolts and compression springs. The compression springs provided a degree of upward freedom when material became lodged in the crusher. The springs would compress and permit the object to pass through the opening.

An eccentric rotating conical head was positioned inside the crusher with the larger diameter at the bottom. This head provided crushing action to the stationary bowl. Large rocks fed into the top of the crusher and fell through the bottom after they were crushed.

Jacks

Four portable hydraulic bottle jacks, two 30-ton, one 50-ton, and one 100-ton capacity jacks, were used to raise the crusher's upper section.

The jacks were designed to provide a large linear force in a small portable package. A handle attached to a small internal ram was used to force hydraulic fluid into the larger lifting ram. The jacks were actuated by applying strokes to the small ram that moved the larger lifting ram a short distance. The rams on the bottle jacks were solid and did not have height adjustments. No defects were found on the jacks.

Jack Positioning

Material was placed above and under the jacks to extend their reach because they had short ram heights.

A 30-ton jack was resting on a wooden block with the ram pressing against the crusher's lower spring segment. A 50-ton jack was positioned to rest on the main crusher frame with a round steel tail pulley shaft on top of the ram pressing against a lug on the upper section of the crusher. A 100-ton jack was resting on the main frame with a stack of various steel plates on the jack's ram. A round steel tail pulley shaft was positioned on top of the plates to press against a lug on the crusher's upper section. Another 30-ton jack was resting on a steel H-beam with the ram pressing against the crusher's lower spring segment. A ¼-inch steel chain had been placed in front of the round steel tail pulley shafts to prevent movement.

Weather Conditions

On the day of the accident, weather conditions were clear and dry, with a temperature of about 65 degrees Fahrenheit. Weather was not considered to be a factor in the accident.

Training and Experience

Samuel M. Kemp had 17 years, 20 weeks, and 3 days experience, all at this operation. He had been assistant superintendent for 7 years, 3 weeks, and 3 days, and had received training in accordance with 30 CFR, Part 46. His experience included jacking up the crusher's upper section about six times to remove objects.

Eric J. Randle had 6 years, 9 months experience, all at this operation, and had received training in accordance with 30 CFR, Part 46. His experience included jacking up the crusher's upper section five or six times to remove objects.

Bryon L. Nipple had 3 years, 1 month experience, all at this operation, and had received training in accordance with 30 CFR, Part 46. His experience included jacking up the crusher's upper section three times to remove objects.

Forrest E. Eiler had 8 years, 5 months experience, all at this operation, and had received training in accordance with 30 CFR, Part 46. His experience included jacking up the crusher's upper section two times to remove objects.

Jon E. Riley had 7 years experience, all at this operation, and had received training in accordance with 30 CFR, Part 46. He had no prior experience jacking up the crusher's upper section prior to the day of the accident.

ROOT CAUSE ANALYSIS

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

Causal Factor: Management policies procedures and controls were inadequate. Management had not developed safe work procedures to remove objects lodged in the crusher. The crew working to free the blocked crusher used jacks to raise the upper section of the crusher while it was under pressure from the compression springs.

Corrective Action: Management should develop and implement procedures to ensure that persons can safely remove objects lodged in the crusher. The manufacturer's procedures should be followed to clear a blocked crusher. Analyze and manage each task to evaluate possible hazards and ensure steps are taken to safely perform the task.

Causal Factor: Management did not have a system in place to prevent metal from entering the crusher.

Corrective Action: Management should install a system to detect and prevent metal from entering the crusher.

CONCLUSION

The accident occurred because management procedures and controls were inadequate and failed to ensure that persons could safely remove objects lodged in the crusher. The manufacturer's procedures for removing objects blocking the crusher were not followed.

ENFORCEMENT ACTIONS

The jacks were not designed to be used in conjunction with steel plates and shafts as extensions. The following citation was issued:

Citation No. 6189672 was issued on January 29, 2008, under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 56.14205:

> A fatal accident occurred at this mine on October 24, 2007, when a miner was struck by material placed on top of portable hydraulic bottle jacks. The victim and coworkers placed steel tail pulley shafts and steel plating on top of the jacks to extend the reach of the lifting cylinders on the jacks. This jacking system was pressurized to compress the springs on a cone crusher and raise the crusher's upper section in an effort to free a metal bucket tooth wedged in the crusher.

This citation was terminated on February 26, 2008, after the mine operator installed an electrically operated hydraulic system to raise the crusher's upper section to remove tramp steel blocking the crusher. This system eliminates the former procedure of using portable hydraulic bottle jacks to raise the upper section. Training was provided to persons using the new hydraulic system.

Approved by: Date:

Steven M. Richetta
District Manager
North Central District

APPENDIXES

APPENDIX A

Persons Participating in the Investigation

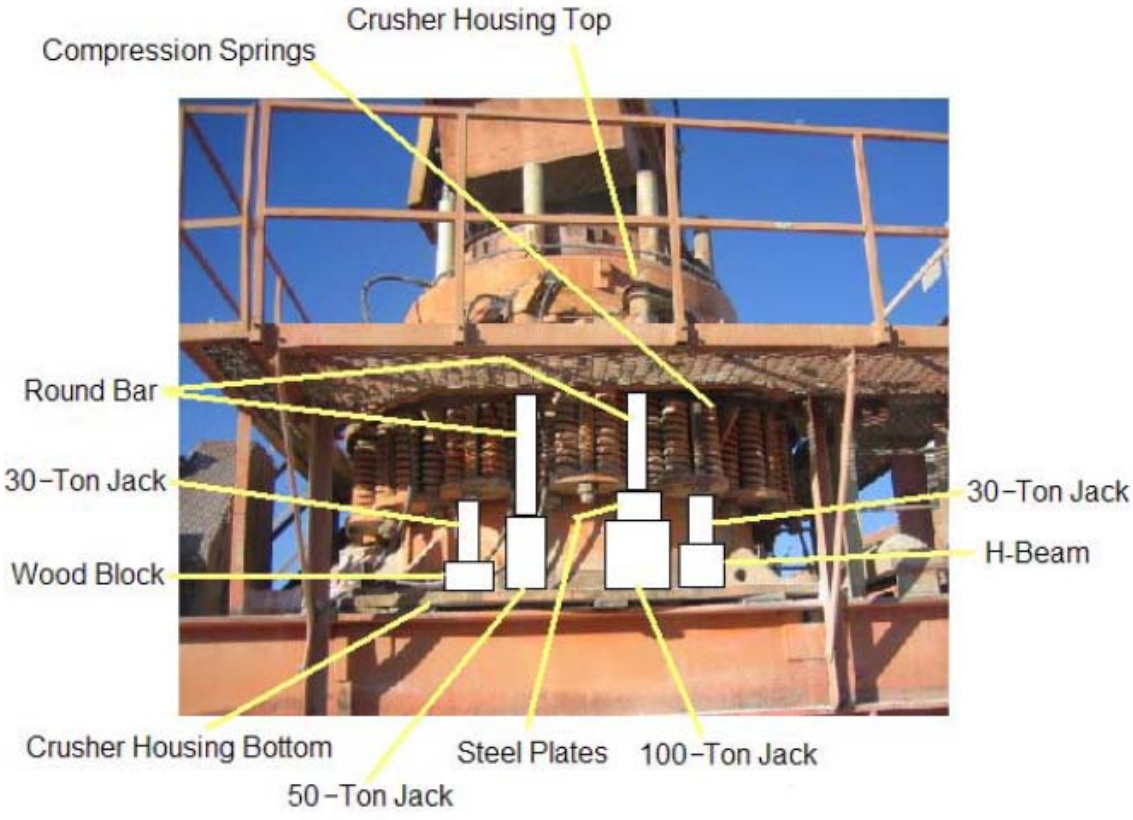
US Aggregates, Inc.

Larry R. Harshbarger	corporate safety director
Stephen L. Rodenbarger	superintendent
Beth A, Stephens	administrative assistant
Eric J. Randle	quality control technician
Wesley A. Snider	parts clerk/safety coordinator
Byron L. Nipple	plant crusher operator
Forrest E. Eiler	primary plant operator
Phillip W. McDermitt	assistant superintendent
Kenneth L. Robinson	vice president/operations

Mine Safety and Health Administration

Stephen W. Field	mine safety and health specialist
Phillip L. McCabe	mechanical engineer

APPENDIX B



Approximate arrangement of the jacks and supports.

Accident Investigation Data - Victim Information

Event Number: 1 0 0 3 7 0 9

APPENDIX C

U.S. Department of Labor
Mine Safety and Health Administration

Victim Information: 1

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:
Samuel M. Kemp	M	36		01 Fatal

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death: a. Date: 10/29/2007 b.Time: 8:00

7. Date and Time Started: a. Date: 10/24/2007 b.Time: 6:00

8. Regular Job Title: 149 Assistant Superintendent

9. Work Activity when Injured: 030 Hand tools

10. Was this work activity part of regular job? Yes | X | No

11. Experience

	Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days
a. This Work Activity:	7	3	3	b. Regular Job Title:	7	3	3	c: This Mine:	17	20	3	d. Total Mining:	17	20	3

12. What Directly Inflicted Injury or Illness? 051 Hand tools

13. Nature of Injury or Illness: 370 Multiple injuries (head)

14. Training Deficiencies:
Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task:

15. Company of Employment:(If different from production operator) Operator

Independent Contractor ID: (if applicable)

16. On-site Emergency Medical Treatment:
Not Applicable: | First-Aid: X | CPR: | EMT: | Medical Professional: X | None:

17. Part 50 Document Control Number: (form 7000-1)

18. Union Affiliation of Victim: 9000 Other not listed

Victim Information:

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death:

7. Date and Time Started

8. Regular Job Title:

9. Work Activity when Injured:

10. Was this work activity part of regular job? Yes | No

11. Experience:

	Years	Weeks	Days		Years	Weeks	Days		Years	Week	Days		Years	Weeks	Days
a. This Work Activity:				b. Regular Job Title:				c: This Mine:				d. Total Mining:			

12. What Directly Inflicted Injury or Illness?

13.Nature of Injury or Illness:

14. Training Deficiencies:
Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task:

15. Company of Employment: (If different from production operator)

Independent Contractor ID: (if applicable)

16. On-site Emergency Medical Treatment:
Not Applicable: | First-Aid: | CPR: | EMT: | Medical Professional: | None:

17.Part 50 Document Control Number: (form 7000-1)

18. Union Affiliation of Victim:

Victim Information:

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death:

7. Date and Time Started:

8. Regular Job Title:

9. Work Activity when Injured:

10. Was this work activity part of regular job? Yes | No

11. Experience:

	Years	Weeks	Days		Years	Weeks	Days		Years	Week	Days		Years	Weeks	Days
a. This Work Activity:				b. Regular Job Title:				c: This Mine:				d. Total Mining:			

12. What Directly Inflicted Injury or Illness?

13. Nature of Injury or Illness:

14. Training Deficiencies:
Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task:

15.Company of Employment:(If different from production operator)

Independent Contractor ID: (if applicable)

16. On-site Emergency Medical Treatment:
Not Applicable: | First-Aid: | CPR: | EMT: | Medical Professional: | None:

17. Part 50 Document Control Number: (form 7000-1)

18. Union Affiliation of Victim: