MAI-2003-03

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

REPORT OF INVESTIGATION

Underground Nonmetal Mine
(Limestone)

Fatal Fall of Person Accident
January 18, 2003

Vulcan Construction Materials, L.P.
Central Quarry
Lexington, Fayette County, Kentucky
Mine I.D. No. 15-00016

Investigators

Donald B. Craig
Supervisory Mine Safety and Health Inspector

Donald R. Baker
Mine Safety and Health Inspector

Robert A. Johnen
Civil Engineer

Originating Office
Mine Safety and Health Administration
Southeast District
135 Gemini Circle, Suite 212; Birmingham, AL 35209
Michael A. Davis, District Manager

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OVERVIEW

Douglas Waddell, foreman, age 37, was fatally injured when the metal cover that he stepped on collapsed, causing him to fall 143 feet to the bottom of an airshaft.

The accident occurred because the metal plate was severely corroded on its underside and could not support the weight of the victim. The deterioration was not detected because the underside of the plate was not visible or accessible. Access to the metal plate covering the airshaft was not blocked against entry and procedures were not established to ensure safe access was provided to perform necessary work in this area.

Waddell had a total of 16 years, 8 months experience, all at this operation. He had been in his present job for 4 years.

GENERAL INFORMATION

Central Quarry, a multiple-level underground limestone operation, owned and operated by Vulcan Construction Materials, L.P., was located at 1280 Manchester Street, Lexington, Fayette County, Kentucky. The principal operating official was Myron Squires, plant manager. The mine normally operated two 11-hour shifts**,** one production and one maintenance, 5 days a week. Total employment was 27 persons.

The room-and-pillar mine was accessed by decline roadways. Limestone was drilled and blasted and the shot rock was loaded onto haul trucks and transported to the underground primary and secondary crushing plants where it was crushed and sized. The material was then conveyed to the surface crushing and screening plants for further processing and stockpiling. The finished product was sold for use in construction, asphalt, and ready-mix concrete.

The last regular inspection at this operation was completed January 17, 2003.

DESCRIPTION OF ACCIDENT

On the day of the accident, Douglas Waddell (victim) reported to work at about 5:40 a.m. Waddell traveled underground and checked on the progress of work assignments at several different areas of the mine. At about 6:00 a.m., he returned to the surface and met with Richard Taylor, underground leadman, to plan the day-shift work assignments. Taylor and Waddell went underground to the primary jaw crusher on the second level and met with the employees and instructed them on their work assignments. Waddell and Taylor proceeded to the first level to check the water level in the sump area. Finding the water level higher than wanted, they went to the water pump discharge hose located at the first level airplane shaft area. They discovered that the water was recirculating around the pillars and returning to the sump area instead of going down the shaft as desired.

Waddell, who had been standing on a grated metal walkway with Taylor, stepped onto the metal plate covering the airplane shaft. He wanted to relocate the hose so the water would go down the shaft. When Waddell stepped onto the plate it gave way. Taylor saw Waddell land on a ledge about 6 feet from the top of the shaft for a brief time, then saw the light from Waddell's cap lamp as he continued falling to the bottom of the shaft. Taylor called out to Waddell and when he did not get a response, he proceeded to the jaw crusher on the second level to get the basket stretcher and first aid supplies. On his way, he met a coworker and told him to go to the surface to call for help. After getting the supplies, Taylor went to the bottom of the airshaft and realized that Waddell had fallen into the water. By this time several coworkers gathered at the bottom of the shaft. Two of them entered the water and carried Waddell to a dry area. Waddell was nonresponsive and the employees were unable to detect any vital signs.

Local emergency medical technicians arrived at the mine and went underground to attend to Waddell. Mine employees placed Waddell onto the basket stretcher and transported him by pickup truck to the surface where the county coroner pronounced him dead at the scene. Death was attributed to multiple blunt force injuries.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 7:25 a.m., on January 18, 2003, by a telephone call from William P. Huffman, Midsouth Division Manager of Safety and Health for Vulcan Construction Materials, L.P., to Harry L. Verdier, assistant district manager. An investigation was started that day. An order was issued under the provisions of Section 103(k) of the Mine Act to ensure the safety of the miners. MSHA's accident investigators traveled to the mine, made a physical inspection of the accident scene, interviewed employees, and reviewed conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management and employees.

DISCUSSION

Location of the Accident

The accident occurred underground at the enclosure covering the airplane shaft located on the north side of the mine. The top of this shaft was located on the first level of the mine, 611 feet above sea level. The ribs in this area were spaced approximately 45 feet apart and the roof was about 42 feet high.

The top of the shaft was flared to about 12 feet in diameter then narrowed to a ledge about 6 feet below the metal fan enclosure. Below the ledge, the shaft was about 8 feet in diameter.

Airshaft Fan and Structure

The structure that enclosed the top of the shaft had been installed prior to the present company purchasing the mine in 1989. Historical information on whether the structure was initially designed or engineered to serve as a permanent access or a working platform was not known. Mine management reported that the structure was not routinely inspected. Reportedly, persons infrequently performed duties that required them to walk on the airshaft enclosure.

A Hurley Ventilation Technologies 50 horsepower, 480 volt, three-phase, model 60-26 Joy fan that forced air from level 1 to level 2 of the mine was installed on the airshaft enclosure. The fan was activated from a junction box located away from the support structure. The fan enclosure in the center of the structure was approximately 10.3 feet square and 4 feet high. The fan was operating at the time of the accident.

The underside of the structure was not accessible during the investigation. Some features were visible at the ends, inside the fan enclosure, and at the area where the victim fell through the metal plate.

The main support for the structure consisted of two I-beams approximately 16-1/2 inches deep, with a web thickness of 1/2 inch and 5/8-inch thick flanges. The beams appeared to be about 37.5 feet long; however, due to the bottom of the structure being inaccessible, determination could not be made whether the beams were continuous across the entire length. Also, the length of the longest free span could not be determined. Since it may have been difficult to deliver beams of this length to the site through the turns of the mine, the beams may have

had one or more welded or bolted joints.

The main beams were positioned east to west across the airshaft. The area between (inside) the beams had secondary and tertiary supports of beams and channels. No measurements could be taken because of restricted access.

Between the main I-beams, expanded metal made of diamond-pattern mesh was visible at the edges of the structure underneath the steel plate. A small section of the expanded metal was visible on the east side of the structure and appeared to be approximately 1/4 inch material in a 1-inch by 2-inch diamond pattern. This expanded metal layer, which may have provided additional support for the steel plate, was not under the plate in the area where the victim fell, and was probably not under the plate anywhere outside the main beams. The support around the area where the victim fell, appeared to be 4-inch channel sections on approximately 4-foot centers each way with the plate positioned on top. The area between the main beams was more substantially constructed than the area outside.

A piece of steel was recovered adjacent to the hole the victim fell through. The piece was easily removed by hand. It measured .500 inch thick at the area least affected by corrosion, and appeared to be a full-thickness sample representative of the plate. Due to deterioration, the sample was striated throughout its thickness and extremely friable. Approximately 18 inches from the area where the victim fell, the plate appeared capable of supporting a person, as a boot print was observed in the dust. Mine management reported that one of the first responders had stepped onto the plate to look through the hole. Other areas were sounded with a rock with negative results.

Steel grating was placed over some areas of the structure 18 to 24 months before the accident occurred. It served as staging areas for work in the area and to mitigate tripping hazards posed by small beams that had been placed on top of the steel plate. The grating was fabricated with 1 by ¼-inch material, with the 1-inch dimension oriented vertically. Spacing of the grating was approximately 1¼ inch. There was no grating over the north side of the structure outside the main I-beam where the victim fell.

Water Hose

The 4-inch diameter fabric hose the victim was trying to move was on the north side of the enclosure adjacent to the pillar rib. The hose came from a sump pump in another area of the mine. When the pump was operated, water would discharge from the hose and run down the airshaft. The discharge end of the hose was lying on the northeast corner of the structure. The hose did not appear to have enough slack for it to be extended and draped over the edge of the structure. There was also minimal area between the structure and the pillar rib to move the hose away from the structure. The surface of the raised enclosure and the surrounding mine floor were dry at the time of the investigation.

The discharge end of the hose, as well as the entire east side of the enclosure, were accessible by walking across the structure, or by taking a longer route around the pillar, north of the structure.

Second Level

The second level mine floor, at the bottom of the shaft, was 468 feet above sea level. A section of the floor in this area had been bermed to retain water and was being used as a water sump. This sump contained approximately 24 inches of water. The victim fell 143 feet to the second level into the water.

Training

The victim had received training in accordance with 30 CFR, Part 48.

ROOT CAUSE ANALYSIS

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

Causal Factor: The metal plate the victim stepped on failed due to corrosion and deterioration that had occurred on the bottom of the plate. An inspection of the underside of the plate could not be conducted because it was not visible or accessible.

Corrective Action: Materials used to cover open areas that cannot be inspected on their underside should be barricaded against entry. If access to such areas is determined necessary, appropriate testing should be conducted to establish the integrity of the structure prior to

persons working in the area.

Causal Factor: The metal plate over the shaft opening was not maintained and had deteriorated due to the wet environment.

Corrective Action: Formulate a planned maintenance program that requires formal inspections of metal structures located in wet or corrosive environments. Ensure defects noted are promptly corrected to eliminate hazards.

Causal Factor: A risk assessment that would have identified possible hazards had not been conducted prior to the victim working in this area.

Corrective Action: Risk assessments should be conducted to identify potential hazardous conditions. Such conditions should be corrected prior to work being done in the area.

CONCLUSION

The accident occurred because the metal plate was severely corroded on its underside and could not support the weight of the victim. The deterioration was not detected because the underside of the plate was not visible or accessible. Access to the metal plate covering the airshaft was not blocked against entry and procedures were not established to ensure safe access was provided to perform necessary work in this area.

VIOLATIONS

Order No. 6105562 was issued on January 18, 2003, under the provisions of Section 103(k) of the Mine Act:

> A fatal accident occurred at this operation on January 18, 2003, when a mine foreman was attempting to reposition a water hose at the Airplane Fan Shaft area of the first level. This order is issued to assure the safety of all persons at this operation. It prohibits all activity in the vicinity, excluding fan controls, of the Airplane fan shaft at the first level 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 to recover and/or restore operations to the affected area.

This order was terminated on January 21, 2003. The area was barricaded against entry until new installations could be completed and normal mining operations can resume.

Citation No. 6099100 was issued on February 3, 2003, under the provisions of Section 104(a) of the Mine Act for violation of 30 CFR 57.11001:

> A fatal accident occurred at this operation on January 18, 2003, when a foreman and a leadman were attempting to reposition a water discharge line adjacent to a fan installed on top of a ventilation shaft. While accessing the discharge line, the victim walked on the metal plate covering the airshaft. The metal plate had deteriorated from rust. When the foreman stepped on the metal plate, it failed, causing him to fall 143 feet down the shaft to the level below. A safe means of access was not provided and maintained at this work area. A risk assessment to determine possible hazards was not conducted prior to initiating this work.

This citation was terminated on January 23, 2003. A safe access was provided at the airshaft. The operator installed a 30-foot long, 9-foot round pipe into the shaft. The pipe is sitting on solid rock and the opening around the shaft has been filled with concrete. The pipe extends 50 inches above the mine floor for the fan placement.

Approved by: _____ Date: _____
Michael A. Davis
District Manager

APPENDIXES

A. Persons Participating in the Investigation
B. Persons Interviewed
C. Accident Investigation Data Form 7000-50a
D. Victim Data Form 7000-50b
E. Sketch of Accident Site
F. Detailed Sketch of Accident Site

APPENDIX A

Persons Participating in the Investigation

Vulcan Construction Materials, L.P.

Fred W. Buckner	area operations manager
Myron Squires	plant manager
Richard L. Seago	corporate manager, safety services
William P. Huffman	division manager, safety and health
Robert G. Muncy	area safety and health representative
Clifford Edward Zupp	electrician
Richard L. Taylor	underground leadman
Sharon Dean	administrative assistant

Mine Safety and Health Administration

Donald B. Craig	supervisory mine safety and health inspector
Donald R. Baker	mine safety and health inspector
Robert A. Johnen	civil engineer

APPENDIX B

Persons Interviewed

Vulcan Construction Materials, L.P.

Myron Squires	plant manager
Richard L. Taylor	underground leadman
Clifford Edward Zupp	electrician