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UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

Surface Coal Mine

Fatal Machinery Accident
June 26, 2003

at

Craney Mine
Solar Sources, Inc.
Cannelburg, Daviess County, Indiana
I.D. No. 12-01732

Accident Investigators

Dennis R. Plab
Coal Mine Safety and Health Inspector
(Roof Specialist)

Vernon Stumbo
Coal Mine Safety and Health Inspector
(Surface Specialist)

Leland Payne
Mine Safety and Health Specialist (Training)

Gene Hennen
Mechanical Engineer

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District 8
2300 Willow Street, Vincennes, Indiana 47591
James K. Oakes, District Manager

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OVERVIEW

On June 23, 2003, a 47-year old mechanic (Keith M. Rohleder, victim) with 27 years of mining experience was fatally injured at a surface mine repair yard while preparing to move a section of an excavator mainframe with a front-end loader. The mainframe was to be used to block up another piece of equipment that was going to be repaired. After the front-end loader operator positioned the loader bucket over the mainframe section, the victim reached under the bucket to attach a chain between the mainframe section and the bucket. During the process, the loader bucket drifted downward, pinning the victim's head between the mainframe and the bucket.

GENERAL INFORMATION

The Craney Mine, operated by Solar Sources, Inc., is a surface coal mine located on the Cannelburg Road, two miles south of Cannelburg, Davies County, Indiana. The mine produces an average of 3,700 tons of bituminous coal per day coal and employs 110 people. The mine has two production shifts and one maintenance shift per day and operates six days per week. The average seam thickness is 24 inches.

The mine operates two pits, referred to as the Billings (001) and Midway (002). The mining process consists of a truck/shovel operation involving drilling and blasting. The coal is removed from the pit and transported by trucks to the coal stockyard and the coal preparation plant. The coal is then transported by over-the-road trucks to area utility plants.

The last regular safety and health inspection by the Mine Safety and Health Administration (MSHA) was completed on February 10, 2003. At the time of the accident, the Non-Fatal Days Lost (NFDL) Incidence rate for the mine was 2.47. The NFDL rate for the Nation for surface mines was 2.26.

The principle officers for the Craney Mine at the time of the accident were:

Roger Campbell .....Preparation Plant Superintendent
Stephen Edwards.....Safety Director
Ernie Seib.....Pit Foreman
Tony Chamberlin .....Preparation Plant Foreman

DESCRIPTION OF THE ACCIDENT

On June 23, 2003, Keith M Rohleder, Mechanic (victim), started his shift at approximately 6:00 a.m. at the Midway Pit area of the Craney Mine. After completing his assigned maintenance work in the Midway Pit, he traveled over to the Billings Pit main surface repair yard to resume work on a 988-F Caterpillar front-end loader, which was being torn down to be bushed and pinned. At this time, Gary Mulzer, Mechanic, was also working in the main surface repair yard performing maintenance on a dump truck. The two men continued at these duties until around noon, when they took a lunch break.

During lunch, Rohleder asked Mulzer to help him split the 988-F front end-loader so he could continue work on the machine. They decided to use the 980-C front end-loader to move material needed to block the 988-F loader prior to separating it. A smaller front end-loader equipped with forks was normally used for this task, but was being used by the pumper at that time.

After lunch, at approximately 12:30 p.m., Mulzer drove the maintenance truck approximately one mile to the Billings Pit parking lot to get the 980-C front end-loader. Upon arrival, he spoke briefly with two contract mechanics concerning some repairs they were performing on other haul trucks.

Mulzer returned with the 980-C front end-loader to the Billings Pit surface repair yard around 12:40 p.m. They considered using wooden crib blocks for blocking, which were located at the east end of the yard. However, Rohleder decided to use a metal section of a main frame of an 801 Hitachi shovel, which mechanics often used to block raised equipment. The metal block was located nearby in the yard and Mulzer drove the 980-C front-end loader to the metal block location.

Rohleder was standing behind the metal block holding a chain in his left hand, when Mulzer arrived with the loader. Rohleder signaled with his right hand for Mulzer to position 980-C front-end loader bucket over the metal block. After positioning the bucket, Mulzer applied the loader parking brake. At this point, Rohleder was going to hook the metal block to the front-end loader bucket with a chain. During this time, Rohleder disappeared from Mulzer's field of vision. After several minutes, Rohleder had not returned to his field of view. Mulzer then dismounted the front-end loader and walked toward the bucket to see what was taking so long.

Mulzer saw that Rohleder's head was pinned between the metal block and the bucket. Mulzer rushed back to the operator's cab and raised the bucket. He then checked Rohleder for a pulse and found none. Mulzer screamed for help and Joe Hopewood, a contract welder located approximately 180 feet from the accident site, quickly responded. Hopewood also checked Rohleder for a pulse and found none.

Mulzer traveled to the coal stockyard office (location of the nearest telephone) and called the company's main office at Petersburg, Indiana. Mulzer talked to the secretary and she instructed him to call the mine scale house. Mulzer called the scale house attendant, who

then called 911 emergency services. The emergency services received the call at 12:44 p.m.

Daviess County Deputy Sheriff Dave Fleming and a Washington, Indiana, ambulance service (Southwest Medical), responded to the 911 call, and arriving at the accident site at 12:56 p.m. County Deputy Coroner Gail Meredith arrived at the accident scene shortly thereafter. Meredith examined the victim and pronounced him dead at 1:30 p.m. on June 23, 2003. The victim was transferred by ambulance to the Washington General Hospital located at Washington, Indiana, approximately six miles northwest of the Craney Mine. Later the body was transported to the Becher-Kluesner Inc. Funeral Home located in Jasper, Indiana, where an autopsy was performed by Dr. Mark M. LeVaugn.

INVESTIGATION OF THE ACCIDENT

Jamie Williams, secretary of Solar Sources, Inc., notified the MSHA, Vincennes, Indiana, Field Office, of the accident at approximately 1:15 p.m., Eastern Standard Time (EST). MSHA was also informed that emergency personnel from Southwest Medical, Cannelburg Fire Department, and Daviess County Sheriff Department had been notified and had quickly responded.

Gary W. Jones, Supervisory Coal Mine Safety and Health Inspector, Vincennes Field Office, Vernon Stumbo and Dennis R. Plab, Safety and Health Coal Mine Inspectors, were dispatched to the scene to secure the accident site. MSHA dispatched an accident investigation team with members from the Vincennes, Indiana Field Office and the Mechanical Safety Division of the Approval & Certification Center located at Tridelphia, West Virginia, to the Craney Mine on Friday, June 27, 2003.

Upon arriving at the mine, the accident investigation team established contact with management officials of Solar Sources, Inc. Joe Batson, Director for the Indiana Bureau of Mines, met with the team at this time and assisted with the investigation. Informal interviews of individuals at the mine known to have actual knowledge of the facts surrounding the accident were conducted at the Craney Mine on June 26, 2003. Formal interviews were held on June 30, 2003 with the same individuals and these interviews were tape-recorded.

DISCUSSION

Human Factors

Rohleder had no known physical impairments or medical conditions that would have contributed to the accident. An examination of Rohleder's training records revealed that there were no violations of 30 CFR Part 48 that contributed to the accident. There were no eyewitnesses to the accident.

Physical Factors at the Accident Site

The surface repair yard was also utilized for storage of spare parts, equipment and other material used in the mining operations. The ground level of the surface repair yard was compacted shale, rock, and soil. The ground surface of the repair yard appeared level in the immediate area. According to survey measurements taken and calculations made, the loader was parked on approximately a 2.5% grade. The weather conditions were clear and dry with temperatures in the mid-90 degrees Fahrenheit at the time of the accident.

Rohleder was positioned underneath the loader bucket, attempting to hook a chain from the metal blocking to the front-end loader bucket. There were no blocks or other mechanical means of control being utilized to secure the bucket into position to prevent accidental movement. The equipment operator was located in the cab of the front-end loader and could not see the victim at the time of the accident.

Equipment

The 1984 Caterpillar Model 980C wheel-mounted front-end loader (Serial Number 63X0547) was evaluated and tested on June 24-27, 2003. Testing showed that the drift rates for the bucket tilt cylinders and the boom lift cylinders were within the acceptable range listed in the manufacturer's maintenance manual. The drop rate for the bucket was approximately one inch per minute when the hydraulic fluid temperature was approximately 135°F.

Although no defects were found in the operation of the service brakes and park brakes, an audible air leak of approximately one psi (pounds per square-inch) per minute was found in the air supply hose connecting to the service brake treadle valve. When placed on the 2 ½ percent grade at the accident site with both the service brake and park brake released, the front-end loader moved backward approximately 4 inches and the height of the bucket in reference to the mainframe was reduced by ¼ inch.

The reverse alarm provided for the 980-C loader would not function when checked. This condition did not contribute to the accident.

ROOT CAUSE ANALYSIS

A root cause analysis was performed using the data from the accident. The following causal factors and root causes were identified:

Causal Factor: The victim was unaware of the downward drift of the front-end loader bucket.

Corrective Action: Management shall ensure that all raised equipment be blocked against motion prior to persons performing work underneath them.

Causal Factor: Other than normal methods were being used to raise and move material.

Corrective Action: Management should establish standard procedures to be followed when lifting and moving blocking material. Employees should be trained in these procedures.

CONCLUSION

The cause of the accident was that the front-end loader bucket was not blocked against motion while work was being performed underneath the raised bucket.

ENFORCEMENT ACTIONS

A 103(k) Order (No.75664 61) was issued on June 23, 2003, and was terminated on June 26, 2003, under the provision of Section 103(k) of the Mine Act.

A Section 104(a) citation (No. 7592325) was issued on July 10, 2003. A lead mechanic was performing work beneath a 980-C front-end loader bucket. The front-end loader bucket was not blocked against motion. This practice resulted in a fatal machinery accident on June 23, 2003.

A spot inspection (CAA) was conducted concurrently with the investigation to address any enforcement issues not contributing to the accident.

Approved by:

ORIGINAL SIGNED BY: James K. Oakes on November 21, 2003

_____ _____

JAMES K. OAKES Date
District Manager

APPENDIX A

Listed below are those persons who participated and/or were present during the investigation:

SOLAR SOURCES, INC.

Donald R. Guth	Mechanic
Stephen Edwards	Safety Director
Ernie Seib	Pit Foreman

K&S Welding & Fabrication

Joe Hopewood	Welder

DAVIESS COUNTY OFFICIALS

Dave Flemming	Deputy Sheriff
Linden Bowles	County Coroner
Gail Meredith	Deputy County Coroner

INDIANA BUREAU OF MINES

Joe Batson	Director

MINE SAFETY AND HEALTH ADMINISTRATION

Gary W. Jones	Supervisory Coal Mine Safety and Health Inspector
Dennis R. Plab	Mine Safety and Health Specialist (Roof Control)
Vernon Stumbo	Mine Safety and Health Inspector (Surface)
Leland Payne	Mine Safety and Health Specialist Education Field Services

APPENDIX B

EQUIPMENT: 1984 Caterpillar Model 980C wheel mounted front endloader (Serial Number 63X0547).

Date of equipment evaluation: June 24-27, 2003.

Equipment principal Investigator: Eugene D. Hennen, Mechanical Engineer, Mechanical & Engineering Safety Division, Approval and Certification Center.

PURPOSE OF EVALUATION: Determine if any equipment related factors contributed to the accident.

PHYSICAL FACTORS:

MACHINE INFORMATION: The wheel mounted front endloader involved in the accident was a 1984 Caterpillar Model 980C with Serial Number 63X0547. The loader had a 270 horsepower Caterpillar Model 3406 diesel engine. The weight of the loader was approximately 58,000 pounds. The loader had a 5.25 cubic yard bucket.
TILT CYLINDER DRIFT TEST: The drift rate of the bucket tilt cylinders was tested according to the test methods described in the manufacturer's maintenance manual for the Caterpillar Model 980C loader. The hydraulic system was operated until the hydraulic fluid was heated to one of the recommended test temperatures of 120 degrees F. The boom was raised to the maximum height, the bucket was leveled, and the bucket tilt control was placed in the hold position. The distance the cylinder rod retracted in 2.7 minutes was then measured. The maintenance manual included a chart listing the acceptable drift rates for various hydraulic fluid temperatures. During the test, the bucket tilt cylinder rods retracted 0.05 inches in 2.7 minutes, which was less than the specified maximum drift rate of 0.75 inches in 2.7 minutes.

LIFT CYLINDER DRIFT TEST: The drift rate of the boom lift cylinders was tested according to the test methods described in the manufacturer's maintenance manual for the Caterpillar Model 980C loader. The hydraulic system was operated until the hydraulic fluid was heated to one the recommended test temperatures of 120 degrees F. The boom was raised to the maximum height, the bucket was leveled, and the bucket tilt control was placed in the hold position. The distance the cylinder rod retracted in 2.7 minutes was then measured. The maintenance manual included a chart listing the acceptable drift rates for various hydraulic fluid temperatures. During the test, the bucket lift cylinder rods retracted 0.50 inches in 2.7 minutes which was less than the specified maximum drift rate of 0.75 inches in 2.7 minutes.

BUCKET DROP RATE: A bucket drop rate test was conducted in order to translate the rate of boom and tilt cylinder drift into a total bucket drop rate. An attempt was made to

try to simulate the conditions during the accident. The hydraulic fluid temperature was considered a factor in the drift rate. Reportedly, the loader was loading coal from the pit approximately 2 ½ hours earlier in the shift. The machine sat idle with the engine off for approximately 3 ½ hours before it was moved from the pit to assist in moving the excavator mainframe section. The pit was approximately one mile from the repair yard. The maximum temperature for the hydraulic fluid listed in the tables for the boom lift and tilt cylinder drift tests was 150°F. Although the exact temperature of the hydraulic fluid at the time of the accident is unknown, the test was conducted with a hydraulic fluid operating temperature of 135 degrees F (15°F less than the maximum temperature listed in the tables for the boom and tilt cylinder drift tests). The bucket was placed in the approximate position it was reportedly in at the time of the accident. With the engine running and the boom and tilt controls centered, the amount of bucket drop was measured over a two minute period. The bucket dropped approximately 2 inches in the two-minute period, resulting in a drop rate of approximately 1 inch per minute.

SERVICE BRAKE TEST: The service brake system was an air over hydraulic system with multi-disc fully enclosed oil-immersed brakes at each wheel. The service brakes on the loader were tested on a grade of approximately 11.5 percent. With the loader coasting down the grade the service brakes were applied. The service brakes stopped and held the machine on the 11.5 percent grade.

PARK BRAKE TEST: The park brake was a spring-applied, air released dry multiple-disc drive line brake. The operator of the loader stated the park brake was set and the engine was running at the time of the accident. The machine was placed on an 11.5 percent grade and the park brake was applied. The loader was left on the grade with the park brake applied and the engine running for 15 minutes. The park brake held the loader on the grade.

AIR SYSTEM: A calibrated air pressure gauge was placed in the air system to check the air compressor cut-in and cut-out pressure. The machine was started with no air in the air system. The compressor charged the air system until the compressor cut out at approximately 120 PSI. With the machine running, the service brake was applied several times to lower the pressure in the air system to check the pressure where the compressor cut in to recharge the system. The compressor started recharging the air system when the pressure dropped to approximately 100 PSI. The air system included an automatic air dryer. The air dryer was designed to discharge air any time the pressure in the air system was above the compressor cut in pressure. This discharge of air removes the water, the dryer captured from the compressed air, from the dryer. If the pressure in the air system dropped below the compressor cut-in pressure, the air dryer was designed to stop discharging air from the system. While the loader was running, an air leak was audible. This leak was traced to the supply hose connecting to the service brake treadle valve. To check the air leakage rate, the air system was fully charged and the machine was shut off. The pressure in the air system dropped to the compressor cut-in pressure of approximately 100 PSI in approximately 1 minute. Most of this air pressure loss was caused by the air being discharged by the automatic air dryer. When the pressure in the air system dropped to the compressor cut-in pressure, the air dryer performed as

designed, and shut off the discharge of air through the air dryer. After the discharge through the air dryer stopped, the rate of leakage in the air system was reduced to approximately 1 PSI per minute.

GRADE: The average grade at the location of the accident was 2 ½ percent. The machine was placed in the approximate location it was located at the time of the accident. The service brake was released and the machine moved until the front wheel went into a small dip in the surface of the ground. The machine moved backwards approximately 4 inches and the distance between the bottom of the bucket and the mainframe that the chain was being fastened to at the time of the accident was reduced by ¼ inch.

SUMMARY:

Testing showed that the drift rates for the bucket tilt cylinders and the boom lift cylinders were within the acceptable range listed in the manufacturer's maintenance manual for the loader.

The drop rate for the bucket was found to be approximately 1 inch per minute when the hydraulic fluid temperature was approximately 135˚F.

No defects were found in the operation of the service brakes and park brakes.

An audible air leak of approximately 1 psi/minute was found in the air supply hose connecting to the service brake treadle valve.

The grade at the location of the accident was approximately 2 ½ percent.

When placed in the location of the accident with both the service brake and park brake released, the machine moved backward approximately 4 inches and the height of the bucket in reference to the mainframe was reduced by ¼-inch.