

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

REPORT OF INVESTIGATION

SURFACE NONMETAL MINE
(Sand & Gravel)

Fatal Machinery Accident
May 3, 2008

Ahart Hauling
Ahart Gravel and Sand
Almo, Calloway County, KY
Mine I.D. 15-19227

Investigators

Billy R. Randolph
Supervisor Mine Safety and Health Inspector

Harold J. Wilkes
Mine Safety and Health Inspector

James B. Pfeifer, PE
Civil Engineer

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Originating Office
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Southeastern District
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OVERVIEW

Gary W. Ahart, owner, age 51, was fatally injured on May 3, 2008, when the excavator he was operating fell into an 8-foot deep sump hole. He was attempting to clean a clogged ditch to drain water from the pit after a recent rain. Sump holes had previously been dug in the pit floor to drain water. The pit floor was covered by several feet of water and the sump holes were not visible.

The accident occurred because management policies and procedures failed to address the hazard created by sump holes that were not visible. All hazards were not identified to ensure that persons could safely perform the task. Barricades or warning signs, visible from all approaches, were not erected to warn persons of a hazard that was not immediately obvious.

GENERAL INFORMATION

Ahart Hauling, a surface sand and gravel mine operated by Ahart Gravel and Sand, was located two miles southwest of Hardin, Calloway County, Kentucky. The principal operating official was Gary W. Ahart, owner. The mine normally operated one shift per day, five days a week. Total employment was eight persons. All employees working at the mine were family members.

Sand and gravel was mined from a pit with an excavator and hauled by trucks to a plant where it was washed, screened, and stockpiled. The finished products were shipped to a local concrete plant and also sold to the general public.

MSHA had not been notified that this mine was in operation prior to the accident. A non-contributory citation was issued. An inspection was conducted following the fatal investigation.

DESCRIPTION OF ACCIDENT

On the day of the accident, Gary W. Ahart, (victim) and Homer Ahart, laborer, victim's father, reported for work at 7:00 a.m. They worked in the washing and screening plant in the morning. After lunch, Gary Ahart moved an excavator to the North pit to drain water that had accumulated in a ditch from a heavy rain the night before. Cary Ahart, laborer, victim's son and Bo Holmes, laborer, victim's foster son, went to the plant, loaded a haul truck, and delivered material.

About 3:15 p.m., Holmes returned to the North pit and saw the excavator Gary Ahart was operating partially submerged. Holmes telephoned Gary Ahart's wife who notified local emergency services.

At 3:35 p.m., emergency services personnel arrived but could not reach Gary Ahart because the operator's compartment was crushed and submerged. Additional excavators were brought to the scene to assist in the recovery effort.

An excavator removed loose material from the drainage ditch so water could drain from the pit. A dike was constructed around the victim's excavator to lower the water level.

After water receded from the area, emergency services personnel extracted the victim from the cab and he was pronounced dead at 5:25 p.m. by the Calloway County Coroner. The cause of death was attributed to asphyxia due to drowning.

INVESTIGATION OF THE ACCIDENT

The Mine Safety and Health Administration (MSHA) was made aware of the fatality on May 5, 2008, by a television news report. MSHA was not notified of the accident and a non-contributory citation was issued. An investigation was started immediately. 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, made a physical inspection of the accident scene, interviewed employees and others, and reviewed documents, conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine employees, the Calloway County Fire and Rescue Department, and the Calloway County Coroner's office.

DISCUSSION

Location of Accident

The area where the accident occurred was located approximately 500 feet north of the washing and screening plant in an area referred to as the North pit. The pit was created when the upper 15 feet (approximate) of sand and gravel was mined. It was rectangular-shaped and approximately 500 feet long (north-to-south) and 65 feet wide (east-to-west). The floor of this portion of the pit was relatively flat with a slight slope (down) toward the north. The sidewalls at the northern and western sides of the pit were nearly vertical highwalls approximately 15 to 20 feet high. A small amount of colluvium (gravity-deposited soil) was observed at the bases of the highwalls. Erosion channels were also observed in the highwall directly west of the washing and screening plant.

The northern half of the pit was backfilled with material that was excavated during the construction of several sediment control ponds. The backfilled area was approximately 6 to 7 feet higher than the floor of the pit causing rainwater to collect and pond in the southern portion of the pit. This water had been ponded in the pit since October 2007.

Three sump holes and a ditch had been excavated about a month before the accident to collect and drain the ponded water. The sump holes were excavated in the southern portion of the pit that was not backfilled. The ditch was excavated in the backfilled material. At the time of the investigation, the width of the ditch varied between 5 to 10 feet and was approximately 3 feet higher than the floor of the pit. The ditch diverted water from the pit to the north and west where it was discharged behind a riprap dike. The riprap dike was located in a natural valley that sloped downward toward the north.

Approximately three inches of rain fell the day prior to the accident. The suspended silt and clay made the standing water in the pit exceptionally cloudy.

The sump hole where the accident occurred was 5 feet wide, 22 feet long, and 11 feet deep. It was oriented in the north-south direction. The sidewalls of the sump hole appeared vertical. A wedge of material, approximately 20 inches high and 20 inches deep, was missing from the top of the southern portion of the eastern sidewall. Investigators could not determine if this material was removed during the excavation of the sump hole or if it fell during the accident. The other two sump holes were 14 feet deep, 5 feet wide, and 22 and 25 feet long respectively. They were covered with approximately 1 ½ feet of cloudy water.

The victim's excavator was leaning toward the west at an angle estimated to be greater than 45° with the boom positioned parallel with the tracks. The boom was facing north and the counterweight was facing south. The boom arm was curled toward the cab of the excavator and the bucket was curled in a slightly open position.

Investigators determined that the victim either trammed the left track of the excavator into the sump hole or the rear portion of the left track was overhanging the sump hole. When the left track of the excavator dropped down into the sump hole, the machine tilted to the left. The cab slammed into the western sidewall of the sump hole partially crushing it and trapping the victim under water.

Because the excavator's boom was positioned parallel with the tracks and the arm was not extended, investigators determined that the excavator was tramping or was parked when the accident occurred.

Excavator

The excavator involved in the accident was a 2001 Case Model 9040B hydraulic excavator. It had a Case Model 6T-830 six cylinder diesel 178 horsepower engine. The machine weighed 53,000 pounds and was equipped with a 1.75 yard bucket.

A knob located on a control panel beside of the right arm rest controlled the throttle for the excavator. Turning the knob clockwise increased the engine speed. The throttle was found in the high revolutions per minute (rpm) position after the excavator was recovered. A check with a local Case distributor revealed that the throttle was normally in the high engine speed position when the excavator was being used.

The hydraulic flow for the excavator main hydraulic circuit was provided by two variable displacement axial piston pumps. Each pump had a maximum flow of 56 gallons per minute (gpm). The hydraulic circuit was designed to vary the flow of the pumps to provide only the flow needed for the function being performed. The main hydraulic valves were activated by hydraulic pilot pressure. The hydraulic flow for the pilot circuit was provided by a 5.8 gallon per minute gear pump. The valves controlling the pilot

pressure were controlled by electric solenoids.

After the accident, the intake air breather for the engine was under water. Investigators determined the engine ingested some water before shutting down so the engine was not started during the investigation and the machine functions were not tested.

The power to propel the excavator was supplied by two final drive assemblies. The final drive assemblies were located in the rear of each of the crawlers. Each final drive assembly consisted of a planetary gear box, a spring applied park brake, and an axial piston hydraulic motor. The final drive assemblies were designed to provide both the parking and service brake for the excavator. The controls to the operate crawlers separately were a combination of floor mounted hand or foot operated controls. These controls consisted of a foot operated pedal with a long handle mounted to the front of the pedal to be used for hand control. The excavator had a single floor mounted pedal which could be used to activate both crawlers simultaneously for travel in a straight line.

The hydraulic motors that were part of the final drive assembly served as hydrostatic service brakes for the excavator. These hydraulic motors had crossover relief valves which locked the hydraulic fluid inside of the motors when the travel controls were not being activated. When the travel controls were released, the crossover relief valves were closed blocking hydraulic oil from leaving either of the ports out of the hydraulic motors. With both ports blocked, the motors stopped turning and also stopped the movement of the crawlers causing the excavator to stop. Once the excavator stopped, the motors held the excavator in place by preventing movement of the crawlers.

When the travel controls were activated, hydraulic pressure from the input sides of the travel motors opened the crossover relief valve on the return side of the motor allowing the hydraulic fluid to pass through the hydraulic motor. When the travel controls were not activated, the hydraulic motors held the excavator's crawlers in place. Since the crossover relief valves were internal to the hydraulic motor, a broken hydraulic hose to the hydraulic actuated travel motors did not prevent them from stopping and holding the excavator in place. Although the hydraulic travel motors were always locked when the travel controls were not being activated, the hydraulic travel motors were not considered a park brake. If the hydraulic fluid inside these motors was lost for any reason, the motors would not stop or hold the excavator in place.

The excavator had spring-applied, hydraulically released wet disc brake units in each of the final drive assemblies. When the travel controls were activated, the hydraulic pressure to the travel motors, which was the same pressure that released the hydrostatic service brakes in the hydraulic motor in the final drive assemblies, also released the spring-applied park brake units.

Both the service brake and the park brake were always released simultaneously. With both brake systems released, the pressure to the travel motors allowed the excavator to move. When the travel controls were released and returned to the neutral position, the pressure to both the hydrostatic service brake and the spring-applied park brake was released allowing both brakes to apply to stop and hold the excavator in place.

When the park brake was spring applied, it held the excavator in place if the hydraulic oil in the final drive assemblies was lost. The hydraulic pressure from the hydraulic travel motors to the park brake units traveled through a passage in the planetary gear box. With this design feature, the hydraulic connection between travel motor and park brake unit could not be disconnected; therefore it was not possible to apply or release either the service or park brake without applying or releasing the other brake.

The excavator's digging function was controlled by two joystick controls. These joystick controls were located on the end of each seat's arm rest.

Since the front of the operator's compartment was damaged, the combination foot and hand travel controls that activated the right and left crawlers could not be moved all the way forward. Although this damage prevented these controls from moving all the way forward, they moved freely through the remainder of the normal range of movement. The foot operated control for straight travel moved freely when operated. Investigators determined that the throttle moved freely through the normal range of motion.

Cranes were used to remove the excavator from the water. A crane placed the excavator directly on a trailer and it was transported to the local Case distributor. When the excavator was unloaded, an attempt was made to move it off the trailer but the crawlers would not rotate. The final drive assemblies were designed so both the hydrostatic service brake and the spring-applied park brake were automatically applied when the engine was not running. Since the crawler would not move, either the service brake or the park brake or both were working.

The sun gear was removed from both of the final drive planetary gear boxes to pull the excavator off the trailer. Since the final drive assembly was designed that neither the park brake nor the service brake could be released or applied without releasing or applying the other brake, a pull test of the individual brake systems was not conducted.

Training and Experience

Gary W. Ahart (victim) had 45 weeks mining experience. He had not received training in accordance with 30 CFR Part 46 but was an experienced equipment operator. A non-contributory citation was issued.

ROOT CAUSE ANALYSIS

A root cause analysis was conducted and the following root cause was identified:

Root Cause: Management policies and procedures were inadequate and failed to ensure that persons could safely perform tasks when working on the pit floor. Potential hazards were not identified and addressed before performing the task of dewatering the pit.

Corrective Action: Management should establish policies and procedures to ensure that persons could safely perform tasks when working on the pit floor. The location of the sump holes should be barricaded or posted with warning signs.

CONCLUSION

The accident occurred because management policies and procedures failed to address the hazard created by sump holes that were not visible. All hazards were not identified to ensure that persons could safely perform the task. Barricades or warning signs, visible from all approaches, were not erected to warn persons of a hazard that was not immediately obvious.

ENFORCEMENT ACTIONS

Ahart Gravel and Sand

Order No. 6084448 was issued on May 5, 2008, under the provisions of Section 103 (k) of the Mine Act:

A fatal accident occurred at this operation on May 3, 2008, when an excavator overturned in the mine pit. This order is issued to assure the safety of all persons at this operation. It prohibits all activity in the 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 effected area.

This order was terminated on May 14, 2008, after conditions that contributed to the accident no longer existed.

Citation No. 7751824 was issued on June 9, 2008, under the provisions of Section 104(a) of the Mine Act for a violation of 56.20011:

A fatal accident occurred at this operation on May 3, 2008, when a track mounted excavator overturned in a sump hole, trapping the equipment operator underwater. The excavator was traveling the pit floor with muddy water over the tracks of the machine. The mine operator failed to barricade or place warning signs to warn employees of hazards not immediately obvious to the operator.

This citation was terminated on June 30, 2008, after the sump hole was filled in and all employees were instructed in placing signs in areas where hazards are not immediately obvious to employees.

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

APPENDICES

- A. Persons Participating in the Investigation
- B. Map of the Mine Site
- C. Victim Data Sheet

APPENDIX A

Persons Participating in the Investigation

Ahart Gravel and Sand

Kenneth Ahart	co-owner
Shawn Culver	co-owner/safety manager
Homer Ahart	laborer
Cary Ahart	laborer
Bo Holmes	laborer

Calloway County Fire and Rescue

Earl Hicks	chief
Danny Williams	fire fighter/rescuer
Thomas Morgan	fire fighter/rescuer

Calloway County Coroner's Office

Mike Garland	coroner
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Civilians

David Palmer	excavator operator
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Mine Safety and Health Administration

Billy R. Randolph	supervisory mine safety and health inspector
Harold J. Wilkes	mine safety and health inspector
James B. Pfeifer	civil engineer, PE
Eugene D. Hennen	mechanical engineer, PE