

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

Surface Coal Mine

Powered Haulage Accident

April 21, 2005

Whayne Supply Co. (AZ5)

at

Point Rock Plant
Central Appalachia Mining, LLC
Phelps, Pike County, Kentucky
ID No. 15-07010

Accident Investigators

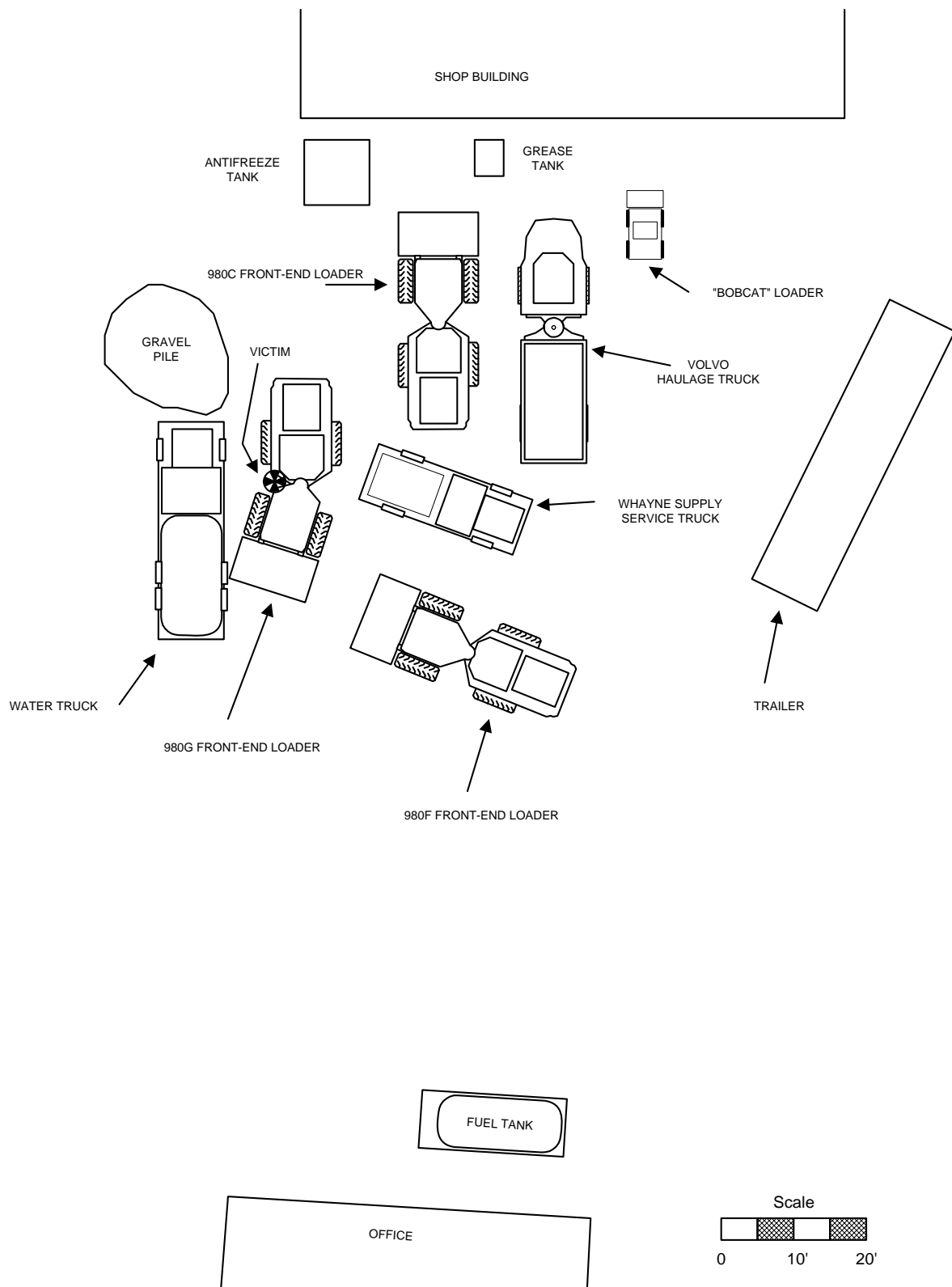
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Sketch of Accident Scene
 Fatal Powered Haulage Accident
 Central Appalachia Mining, LLC
 Point Rock Plant (15-07010)
 April 21, 2005

OVERVIEW

At approximately 2:00 p.m. on Thursday, April 21, 2005, Rocky J. Reynolds, a 22-year-old field technician for Whayne Supply Co., was fatally injured when he was caught between the articulating front and rear sections of a front end loader. Reynolds was working alone and was positioned in the articulation area on the right side (facing forward) of a Caterpillar 980G front end loader. While performing repairs to the steering system, the machine articulated, closing the area where Reynolds was positioned which resulted in fatal crushing injuries. Reynolds had two years and four months total job experience with Whayne Supply Co. starting as a shop technician and had been a field technician for six months.

The direct cause of the accident was failure to shut off the engine and block the loader from motion prior to Reynolds entering the articulation area to repair the steering system. The established safe work procedure, specified by the manufacturer, was not followed, nor was any alternative safe work procedure followed to prevent unintended motion. The steering frame lock, a safety device which disables the articulating capability of the loader was not engaged.

GENERAL INFORMATION

Central Appalachia Mining, LLC, Point Rock Plant, is a coal preparation plant and loadout facility located on Kentucky Route 194 East approximately 1.7 miles northeast of the intersection of Kentucky Route 632 and Kentucky Route 194 near Phelps, Pike County, Kentucky. The main office is located in Pikeville, Kentucky. The principal officials are Larry Gannon, superintendent and Roger Cantrell, safety director.

Central Appalachia Mining, LLC, Point Rock Plant, is a bituminous coal preparation facility with 16 employees and operates 2 eight-hour shifts, five to six days per week. Maintenance is performed each day after the plant has operated for a total of 12 hours. The plant produces approximately 1000 tons of clean coal per day. The plant receives raw coal from various contract underground mines and from highwall miner operations on company surface mines. The coal is cleaned and sized and then loaded into rail cars for shipment. All work on heavy equipment outside of routine maintenance is performed by contractors, usually dealer's service technicians.

Reynolds was employed by Whayne Supply Co., an independent contractor (I.D. AZ5) specializing in the sales and service of heavy equipment. The main office is located at Louisville, Kentucky and the local branch is at 359 S. Lanks Branch Road, Pikeville, Kentucky. The principal officials of Whayne Supply Co., Pikeville Branch are Mark Miller, branch operation manager/vice president, and Joseph Owens, service manager.

The last regular safety and health inspection of the mine prior to the accident was completed on October 15, 2004.

DESCRIPTION OF ACCIDENT

On April 20, 2005, Reynolds was instructed by Kevin Hall, Whayne Supply field service foreman, to travel to the Point Rock Plant on the following day to work on the 980G loader's bucket level system and steering system. The parts believed to be needed to repair the steering system had been ordered and were scheduled to arrive on site on April 21.

The 980G loader was parked in the equipment parking lot located between the plant office and the plant. On the morning of April 21, Reynolds arrived at the parking lot and parked his service truck perpendicular to the 980G loader so the rear of the service truck was facing the left side of the 980G loader. Before beginning work, he spoke with the plant foreman, Gideon Williamson. Reynolds performed repairs to the bucket leveler mechanism while waiting for the necessary parts to arrive to change the steering pilot valve. Kevin Hall contacted Reynolds around 11:00 a.m. to let him know that the parts were en route to the site. The parts arrived around noon and Reynolds began the task of changing the pilot steering valve. Although Reynolds was working by himself, there were employees of Central Appalachia Mining, LLC at the plant office, which was located approximately 80 feet away.

Jamey Damron, equipment operator, and Gideon Williamson, foreman for Central Appalachia Mining, LLC, were standing outside the plant office door at approximately 2:00 p.m., when Damron observed the 980G loader bucket move to the right against the outside tire of the front tandem of the water truck which was parked parallel to the 980G loader. The engine was running and the bucket was raised. He commented to Williamson that the tire on the water truck could be damaged by the end loader bucket. Williamson observed that no one was in the cab of the 980G loader operating the controls and immediately became alarmed. He ran to the right side of the 980G loader where he observed Reynolds trapped in the articulation pivot area between the front and rear sections.

Williamson shouted for Damron to try to steer the machine to the left to free Reynolds and ran back into the office to call 911 for medical help. Damron climbed into the cab and turned the steering mechanism to the left but there was no response.

Williamson contacted Milton Justice, plant operator, who is a certified Medical Emergency Technician (MET) by CB radio. Upon arriving at the accident site, Justice tried unsuccessfully to get a verbal response from Reynolds and checked for a pulse but could find none. Stat EMS Ambulance Service arrived and pronounced the victim dead at 2:14 p.m. The body was recovered at 3:15 p.m. by using another front end loader to pull the front of the 980G loader to the left in order to open the articulation area.

INVESTIGATION OF ACCIDENT

The MSHA Phelps Field Office was notified of the accident by a telephone call at 2:10 p.m. from Gideon Williamson, plant foreman. Benny Freeman, Phelps Field Office Supervisor, and David Thompson, Coal Mine Inspector, traveled to the nearby Point Rock Plant, arriving at approximately 2:15 p.m. A 103(k) order was issued by Thompson to assure the safety of all persons and preserve the accident scene until the accident investigation could be completed.

The Kentucky Office of Mine Safety and Licensing (OMSL) determined that jurisdiction did not apply to their agency and did not participate in the investigation. Interviews were conducted on April 22, 2005, at the MSHA District Office in Pikeville, Kentucky. Eight persons, deemed to have relevant information concerning the accident were interviewed by MSHA.

DISCUSSION

The investigation revealed the following factors relevant to the occurrence of the accident:

1) MACHINE INFORMATION: The vehicle was a Caterpillar articulated diesel powered wheel loader; Model 980G, Serial Number 2KR00473. The machine hours were approximately 22025. The wheel loader was equipped with a FOPS/ROPS cab. The loader is powered by a Caterpillar 3406C DITA engine.

2) MACHINE BACKGROUND: The machine had been at the Whayne Supply Pikeville shop for repairs to the transmission and center articulation pin. The articulation pin is the pin that joins the front frame and rear frame. This repair requires that the two halves of the machine be physically separated. During this process, the hydraulic steering lines had to be disconnected. On April 14, the repairs had been completed and an outgoing machine check had been performed by Tim Nickell, Shop Technician. During this check, it was noted on the form used to notify the customer of additional repairs needed that there was a steering problem, specifically: "After steering left machine will not return to center, will continue turning left until unit is steered right." The mine chose to have the machine returned anyway. Upon arrival at the mine, the vehicle was driven from the flatbed trailer to the accident location. Because the steering problem was worse than what the mine had expected, they requested Whayne to repair it. The victim arrived at the mine on April 21, 2005, to perform the repairs. Prior to the accident the victim had replaced one steering hose and installed a new steering pilot control valve.

3) WARNING LABELS: A Warning Label was located on both sides of the vehicle at the articulation joint. The labels stated:

WARNING: NO CLEARANCE FOR PERSON IN THIS AREA WHEN MACHINE
TURNS. SEVERE INJURY OR DEATH FROM CRUSHING COULD OCCUR.
CONNECT STEERING FRAME LOCK BETWEEN FRONT AND REAR FRAMES
BEFORE LIFTING, TRANSPORTING, OR SERVICING MACHINE IN
ARTICULATION AREA. DISCONNECT LOCK AND SECURE BEFORE RESUMING
OPERATION.

Warnings regarding the dangers of not using the steering frame lock were also found in the Caterpillar 980G Operation and Maintenance Manual (SEBU6946-08; Revision April 2002) as well as the 980G Wheel Loader Steering Systems Operation Testing and Adjusting Manual (SEN5879-06; Revision January 2003).

4) STEERING FRAME LOCK: The 980G includes a steering frame lock located near the articulation joint on the right side of the machine. The steering frame lock is intended to prevent unintended articulation either during shipment or maintenance operations. According to the Caterpillar 980G Operation and Maintenance Manual, the lock should be used when performing service work near the articulation joint. This Manual also states the machine must be in the straight ahead position to connect the steering frame lock. The Manual contains no alternate method of locking the articulation joint in the event the machine cannot be steered to a position to install the steering frame lock pins. At the time of the accident, Whayne Supply also had no written procedure to follow in the event the steering frame lock could not be used.

During the investigation, it was found that installing the pins to lock the frame required the machine to be maneuvered back and forth in order to get the pin holes of the bar to line up with the pin holes on the frame. Although this operation may be possible with a single person (operator), it would be very difficult. It was easily accomplished with a second person on the ground directing the operator to turn the machine in the direction needed to line up the pin holes.

5) MECHANICAL STEERING SYSTEM DESCRIPTION: The steering wheel connects through the steering column to a steering column shaft. The steering column shaft connects to a second shaft. The bottom of this second shaft connects to a lever. A third shaft, the steering shaft, connects to the bottom of the lever. The bottom end of the steering shaft connects to the input shaft of the steering pilot control valve. As the steering wheel is turned, the mechanical shafts turn, thus, the input shaft of the steering pilot control valve turns. The turning of the input shaft directs pilot oil to flow through the pilot control valve (See description below.) and thus turn the machine. The steering pilot control valve uses mechanical feedback to turn off the valve. The steering pilot control valve is turned off by returning it to the neutral position. If the steering wheel is turned to the right and held in place, the machine will turn to the right. When the machine reaches the right turn position that is indicated by the steering wheel, the pilot control valve is shut off.

6) HYDRAULIC STEERING SYSTEM DESCRIPTION: The primary steering system has two basic circuits. These circuits are the high pressure system and the pilot oil system. A secondary steering system is a third circuit that supplies steering if an engine or pump failure occurs. The secondary system can only supply steering when the machine is moving.

High Pressure System: The steering oil pump, which is a load sensing variable displacement piston pump, supplies the high pressure oil for steering the machine. As the steering wheel is turned, pilot oil (described below) shifts a spool valve (steering control valve). The shifting of the spool valve allows high pressure oil to flow to the steering cylinders. As high pressure oil is sent to the head end of one steering cylinder, high pressure oil is also sent to the rod end of the other steering cylinder. This causes the machine to articulate.

Pilot Oil System: The pilot oil system controls the movement of the spool valve. A pilot oil pump provides oil for the pilot circuit. The oil from the pump flows through a screen to a shuttle valve and then into the pilot control valve. As the operator turns the steering wheel, pilot oil is allowed to flow through the pilot control valve to the quad check valves before

going into the end of the steering control valve. The pilot oil pressure shifts the spool valve into the desired position. Excessive pilot oil is returned to the hydraulic tank via the purge orifices located internally in the steering control valve

7) MACHINE EVALUATION: The operation of the steering system was erratic and unpredictable. After much testing and evaluation, the cause of the steering problem was narrowed down to two reasons. The first was that the upper steering column retaining bolts were loose allowing slippage of the steering shaft. This limited the movement of the input shaft of the pilot control valve. After this was corrected, the erratic and unpredictable operation continued.

The second problem found was that the purge orifices in the pilot control system were plugged. The plugging of these orifices did not allow pilot oil to bleed back to tank. The orifices were plugged as a result of some type of contamination. After the orifices were replaced and that part of the hydraulic system cleaned, the steering system functioned properly.

It should be noted that the 980G Wheel Loader Hydraulic System Schematic (SENR5884-01; Revision November 2000) included a schematic for a 980G Update. In that Update, the purge orifices were no longer located internally in the steering control valve. They had been placed externally and had screens placed in front of them.

The technical evaluation revealed that the victim was attempting to troubleshoot and repair a problem with the steering system. He entered the articulation joint with the machine running. The steering frame lock was not used and no alternate method of preventing the machine from articulating was used. The exact reason the machine articulated could not be determined. However it was most likely caused by one of the following or some combination of them:

1. The pilot control valve was manually moved. This could have occurred as the victim was attempting to remove the steering shaft from the pilot valve.
2. The operation of the steering system was erratic and unpredictable as a result of some debris blocking the purge orifices in the steering control valve. Pressure may have built up and/or released sufficiently to allow the machine to move unexpectedly.
3. Air that had been entrapped in the pilot system as a result of the replacement of a steering line "worked out" causing the machine to articulate.

ROOT CAUSE ANALYSIS

An analysis was conducted to identify the most basic causes of the accident that were correctable through reasonable management controls. During the analysis, causal factors were identified that, if eliminated, would have prevented the accident or mitigated its consequences.

Listed below is the causal factor identified during the analysis and the corresponding

corrective action implemented to prevent a recurrence of the accident:

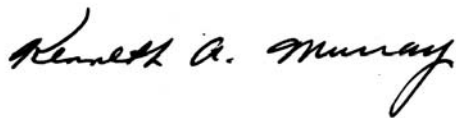
Causal Factor: The standards, policies, and administrative controls used by the contractor did not ensure that safe job procedures were followed at all times. The procedure specified by the manufacturer was not followed and no alternative procedure was used to block the machine from motion when the employee entered the articulation area.

Corrective Actions: The contractor developed a written procedure to prevent a recurrence of the accident. Alternative procedures to prevent motion of the machine are to be implemented prior to performing repair work which requires an employee to enter the articulation area.

CONCLUSION

The accident occurred because a safe work procedure was not followed to secure and block the loader from motion prior to the victim entering the articulation area to repair the steering system. The established safe work procedure, specified by the manufacturer, was not followed. The steering frame lock, a safety device which disables the articulating capability of the loader, was not engaged. Neither was any alternative safe work procedure followed to prevent unintended motion.

APPROVED BY:



Kenneth A. Murray
District Manager

Date: 07/20/2005

ENFORCEMENT ACTIONS

1. A 103(k) order was issued to protect persons from possible hazards until the investigation could be conducted.
2. A 104(a), S&S citation was issued to Whayne Supply Co. The field technician/victim entered the articulation point of the 980G loader without shutting off the machine and engaging the steering frame lock or otherwise blocking the machine from motion as required by 30 CFR 77.404(c).

APPENDIX

List of Persons Participating in the Investigation

Central Appalachia Mining, LLC

Roger Cantrell	Safety Director
Jamey Damron	Equipment Operator
Kevin Dotson	Equipment Operator
Mark Heath	Attorney
Milton Justice	Plant Operator
Mitchell McKinney	Preparation Superintendent
Charles Varney	Maintenance Foreman
Gideon Williamson	Plant Foreman

Whayne Supply Co.

Roger Bentley	Field Technician
Robert Foley	Field Technician
John Gray	Office Sales Representative
Kevin Hall	Field Service Foreman
Karen Hamilton	Executive Secretary
Randy Lane	Mechanic
Mark Miller	Branch Manager & Vice President
Tim Nickell	Field Technician
Joseph Owens	Service Manager
Gary Stephenson	Safety Manager

Liberty Mutual Insurance Company

Blaine Nelson	Senior Field Investigator
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Caterpillar

John Clegg	Attorney
Eileen O'Brien	Attorney
Gene St.Germain	Mechanical Engineer (Hydraulics)

Mine Safety and Health Administration

Robert Baker	Education Field Services
Robert Bellamy	Mining Engineer
Benny Freeman	Supervisory CMS&H Inspector
Kenneth A. Murray	District Manager
Richard Skrabek	Mechanical Engineer
David Thompson	CMS&H Inspector
Timothy Watkins	Asst. District Manager (Technical)
Arlie A. Webb	Supervisory MS&H Specialist



Photograph of Accident Scene



Close up of Articulation Point

Fatal Powered Haulage Accident
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Point Rock Plant (15-07010)
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