MAI-2010-05

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 Machinery Accident
May 5, 2010

C & W Drilling
Contractor I.D. No. MPH
at
Chemical Lime Company of Alabama LLC
Brierfield Quarry
Brierfield, Bibb County, Alabama
Mine I.D. No. 01-00004

Investigators

Curtis G. Roth
Supervisory Mine Safety and Health Inspector

Raymond J. Norwood
Mine Safety and Health Inspector

Ronald Medina, P.E.
Mechanical Engineer

Alan R. Coburn
Mine Safety & Health Specialist

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

OVERVIEW

Cody Dean, drill operator, age 21, died on May 5, 2010, when the drill he was attempting to reposition ran over him. Dean was operating a rubber tired drill in a sloping work area of a quarry.

The accident occurred because contractor management policies, procedures, and controls were inadequate. Contractor management trained the drill operators to move the rubber-tired, truck mounted drill from drill hole to drill hole by leaving the transmission in neutral and allowing the rubber-tired, truck mounted drill to roll to the next hole to be drilled.

GENERAL INFORMATION

Brierfield Quarry, a surface limestone operation, owned and operated by Chemical Lime Company of Alabama LLC, is located in Brierfield, Bibb County, Alabama. The principal operating official is William Rogers, mine manager. The mine operates two, 10 hour shifts per day, five days per week. Total employment was 27 employees.

Limestone is drilled and blasted in the open pit. Excavators load the material in haul trucks that transport the material to a crusher. The material is crushed, sized, processed, and then sold to the general public.

C & W Drilling is an independent contractor located in Saginaw, Shelby County, Alabama. The principal operating official is Woody Quinn, owner. C & W Drilling was contracted by Chemical Lime Company of Alabama LLC to drill holes for blasting at the mine site. The contractor's drillers operated one, 10 hour shift per day, five days per week. The victim was employed by C & W Drilling.

The last inspection at this operation was completed on November 25, 2009.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, Cody Dean (victim) reported to work at 7:00 a.m., his normal starting time. Prior to the start of shift, a coworker, Donald Deason, lead drill operator, called Randy Couch, Supervisor, to report that both employees were at the mine site and ready to start drilling.

Dean and Deason drove to the work area of the pit, referred to as Zone 6, to begin their work day. They measured out the drill patterns for the shot and then began drilling. Two drills were being used. Dean was operating a rubber-tired, truck mounted drill and Deason was operating a track mounted drill. Each driller was responsible for drilling a

section of the pattern to prepare the area for a blast. They worked without incident until 11:00 a.m.

At that time, Deason was operating his track mounted drill and completed a hole. Deason moved the drill to start drilling the next hole when he noticed that the drill Dean had been operating was in a spoil area outside the drill area. He saw Dean lying on the ground and then called for help on his radio.

Rogers heard the call for help and called for Emergency Medical Services (EMS). He sent Josh Gauthier, mining engineer, to assist Deason while he provided information to the EMS. Deason went to Dean and found him unresponsive.

Dawn Thornhill, equipment operator, was operating a road grader in the area and heard Deason call on the radio. She arrived at the scene and began Cardiopulmonary Resuscitation (CPR). Deason shut off his drill and then went to shut off Dean's drill that was still operating. Gauthier arrived to assist but efforts to revive Dean were not successful. EMS and Downey Megee, Shelby County coroner, arrived at the site at 12:05 p.m. Dean was pronounced dead at 1:05 p.m. The cause of death was attributed to blunt force trauma.

INVESTIGATION OF THE ACCIDENT

The Mine Safety and Health Administration (MSHA) was notified of the accident at 11:20 a.m., on May 5, 2010, by a telephone call from William Rogers, mine manager, to the MSHA National Call Center. Doniece Schlick, safety specialist, was notified and an investigation was started the same day. An order was issued under provisions of 103(j) of the Mine Act to ensure the safety of the miners.

MSHA's accident investigation team traveled to the mine, conducted a physical inspection of the accident scene, interviewed employees, and reviewed documents and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine and contractor management and employees, Shelby County EMS and the Coroner's Office.

DISCUSSION

Location of the Accident

The accident occurred at the Zone 6 work area of the pit which was approximately 12,000 square feet. Dean and Deason had been drilling in the blast site two days prior to the accident and had drilled approximately 30 of the 45 holes needed to complete Zone 6. The drill holes were drilled on a 14' x 14' pattern. The elevation of the blast site varied from 327' to 333' above sea level with grades ranging from 3% to 12%.

When Deason went to the victim's drill he found it running and in neutral. The drill had rolled over a small berm and into a shallow depression. Dean had completed drilling a hole and lowered the mast to the stored position. He had retracted the two rear leveling jacks completely and raised the single front jack approximately 12 inches. Dean was located 109 feet from the last hole that he had drilled and 41 feet from his drill.

Drilling Procedure

After drilling a hole, the drill operator would pull the drill steel up, lower the mast, and raise the leveling jacks from the operating controls at the rear of the drilling machine. The drill operator would then walk around to the operator's compartment where the operator would release the park brake and let the machine roll to the next hole as the operator positioned his/her head out the door to make sure the drill location lined up with the next marked hole to drill. The operator had to lean outside the operator's compartment to be able to view this location and assure the machine was positioned properly with the next hole. When the machine was in the correct location, the operator would stop the machine and set the park brake. The operator would then set the jacks and raise the boom to start drilling again. During the investigation, the drill was positioned on the site where the last hole was drilled before the accident and the drill was moved according to normal procedures.

Investigators determined that after Dean had finished drilling the hole, he lowered the mast and raised the leveling jacks. He then walked around to the operator's compartment to release the brake and let the machine roll to the next hole. To accomplish this task, Dean sat on the edge of the operator seat with the cab door open and his head out of the cab. When he released the brake, the machine was sitting on a 8.8% grade and it lunged forward dislodging Dean's upper body from the operator's compartment. Dean tried to remain in the operator compartment but the terrain was rough and he never regained his position in the cab. He stayed with the drill machine for 109 feet, fell out, back first, and the drill machine rolled over him.

Dean was found on the ground, 109 feet from the last hole drilled, where the rear tandem tires of the drill machine had run over him. The position of the body indicated that the back of the upper torso hit the ground first. The drill machine continued 41 feet after the rear tires made contact with Dean and stopped in a spoil area 10 feet lower than the drilling area.

Rubber Tired Drill

The drill involved in the accident was an Ingersoll-Rand Model T4W Water Well Drill Rig consisting of an Ingersoll-Rand Drilling Package, mounted on a Crane Carrier Company, rubber-tired, truck-type chassis. The unit could be driven on public roads. The drilling package was powered by a Cummins QSK19-C engine rated for 525 HP at 1,800 RPM and an air compressor rated for 900 CFM at 350 PSI. The Crane Carrier Company three-axle, 6 X 4, rubber-tired truck chassis was powered by a Caterpillar

3306C engine rated at 300 HP at 2,000 RPM. The drill was equipped with an Eaton Fuller transmission with ten forward speeds and three reverse speeds. It was also equipped with an engine compression brake.

With the derrick down, the length of the rig was 34' 11", the width was 8', and the height was 13' 9". The derrick had an overall length of 33' 3". The approximate working weight of the drill was 59,000 pounds.

The drill operating station was located at the right rear corner of the carrier and was oriented with the drill operator facing the front of the carrier. The controls to raise and lower the mast and leveling jacks were located at the drill operating station. No controls for operating the truck portion of the unit were provided at the drilling station. To propel the drill between holes, the operator had to enter the driver's cab of the carrier chassis located at the front of the machine. No drilling controls were located in the driver's cab.

Position of Controls

After the accident, the transmission gear shift lever was found to be in neutral with the two selector switches on the gear shift lever in the low range, deep reduction (LO-LO) positions. The engine compression brake switch was in the "off" position. The throttle pedal, brake pedal, and clutch pedal moved freely.

Investigators found the park brake selector in the park position and the park brake applied. The air pressure gauge read zero pounds per square inch (psi). A safety feature of the machine immediately applied the park brake when the air pressure became low (dropped below 35 psi).

Service and Parking Brake System Design

The service brake system consisted of an air-operated, two-shoe, internal-expanding drum type arrangement at each wheel. The steering axle was equipped with type 30 brake chambers. Both drive axles were equipped with type 30-30 brake chambers. The type 30-30 brake chambers on the drive axles provided both spring-applied parking brake capability and air-applied service braking capability. The steering axle brake chambers provided only service brake capability. When compressed air entered the service brake chambers, the pushrods extended from the chambers and applied the service brake. The drill was not equipped with a hand brake control.

The rear portion of each drive axle brake chamber provided parking brake capability. Without compressed air in the parking brake portion, a self-contained spring expanded. This extended the pushrod and applied the parking brake. The parking brake could be applied manually with the push-pull parking brake control in the operator's cab or automatically from the loss of air system pressure.

The parking brake push-pull control, as found by the investigators, was found in the "brake applied" position and the dashboard air gauge indicated an air pressure below 35

psi. Testing showed that the parking brake automatically applied when the air pressure shown on the dashboard air gauge dropped below 35 psi. The Safety, Operation, and Maintenance Manual for the drill also stated that the parking brake was designed to automatically apply upon a loss of air pressure in both the primary and secondary brake systems.

Service and Parking Brake Air System Tests

The parking brake control was operated manually numerous times to apply and release the parking brakes and no defects were found. In a timed test, with the engine running, the parking brake was set and remained applied for 65 minutes until the test was stopped. Additional testing showed that the parking brake also set automatically from a loss of air system pressure.

No audible air leaks were found. An air loss test was conducted and the testing showed that, with full air pressure in the tanks, the service brake applied, parking brake released, and the engine stopped, the air loss rate in both the primary and secondary brake systems was no more than 2 psi in 2 minutes. This was an acceptable leakage rate since an air loss rate of up to 4 psi in 2 minutes was acceptable for a machine of this type.

Service and Parking Brake Grade Holding Tests

Testing showed that the parking brake could hold the drill on a 16% grade. When the parking brake was released and then immediately reapplied, the drill coasted a short distance and stopped on the grade.

The drill was repositioned at its initial position where the last hole was drilled. There was a 10% grade at this location and the parking brake held the drill stationary. When the parking brake was released and then immediately reapplied, the drill coasted a short distance and stopped.

The service brake was tested and stopped and held the drill on 16% and 10% grades.

Brake Chambers Pushrod Travel and Slack Adjusters

The service brake chamber pushrod strokes were measured at an application pressure of approximately 100 psi and the maximum allowable pushrod travel for type 30 and type 30-30 brake chambers was two inches. The pushrod travel at all six wheels was within this specification.

Brake Drums and Linings

After testing the brakes at the accident site, the wheels were removed from the drill and the brake drums and foundation brake components were inspected. The drill was equipped with 16½ inch brake drums at all six wheels. The inside diameters of all the brake drums were measured and the maximum allowable inside diameter stamped on the

brake drums was 16.620 inches. The inside drum diameters, at all six wheels, were within this specification.

The brake drum at the left-front tandem was coated with gear oil. The oil on the drum was clean and black without dust and dirt mixed in. The source of the oil was a leaking wheel seal. This did not appear to be a longstanding condition since the oil was black and not contaminated with dust and dirt. Damage to this seal resulting from the drill striking the gob pile could not be ruled out. The other five brake drum friction surfaces were clean and dry.

The brake linings were 3/4 inches thick at the front axle wheels, 3/8 inches thick at the front tandem axle wheels, and ½ inch thick at the rear tandem axle wheels. These measurements were within the acceptable wear limits for these linings.

Steering System

No steering defects were found during operational testing. When the front wheels were removed, investigators found that the steering tie rod had been gouged where it had been rubbing against a steering cylinder mounting bolt. The bolt was too long and rubbed against the tie rod when the steering wheel was turned fully to the right. This was not a contributing factor in the accident and a non-contributory violation was issued.

Leveling Jacks

The machine was equipped with three hydraulically operated leveling jacks. One leveling jack was mounted at the center of the front bumper of the carrier and the other two leveling jacks were mounted at the rear corners of the carrier.

The rear jacks were found to be fully retracted. The front jack was found to be partially extended but not far enough to contact the ground. In addition, the round jack pad or jack foot for the front jack was missing and a non-contributory violation was issued.

Seat Belt

The seat belt was inspected and found to be functional with no damage.

Weather

The weather conditions on the day of the accident were clear and sunny with a high temperature of 81 degrees Fahrenheit. Weather was not considered to be a factor in the accident.

Training and Experience

Cody Dean had 8 months, 23 days of mining experience, all at this operation and had received training in accordance with 30 CFR Part 46. However, the task training for the drill he operated was not adequate.

Donald Deason had 10 years of mining experience, 2 years with C & W Drilling and 1 year at this operation. He had received training in accordance with 30 CFR Part 46.

ROOT CAUSE ANALYSIS

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

Root Cause: Contractor management policies, procedures, and controls were inadequate and failed to ensure that operators could safely move the drill from one hole to the next hole to be drilled.

Corrective Action: Contractor management policies, procedures, and controls were established to ensure that persons used the proper procedures to maintain control of the drill at all times when re-positioning it to another hole.

Root Cause: Contractor management failed to properly task train drill operators in the safe operation of the rubber tired drill.

Corrective Action: All drill operators were tasked trained in the safe operation of the drill.

CONCLUSION

The accident occurred because contractor management policies, procedures, and controls were inadequate. Contractor management trained the drill operators to move the rubber-tired, truck mounted drill from drill hole to drill hole by placing the transmission in neutral and allowing the rubber-tired, truck mounted drill to roll to the next hole to be drilled. The drill operator was not trained to shut the operator's compartment cab door and use the rear view mirrors to position the drill.

ENFORCEMENT ACTIONS

Chemical Lime Company of Alabama LLC

Order No. 6097426 was issued on May 5, 2010, under the provisions of Section 103(j) of the Mine Act:

A fatal accident occurred at this operation on May 5, 2010, when a drill operator was run over by a rubber tired Ingersoll Rand Drill, model T4W. This order is issued to assure the safety of persons at this operation and prohibits any work in the affected area until MSHA determines that it is safe to resume normal operations as determined by an Authorized Representative of the Secretary of Labor. The mine operator shall obtain approval from an Authorized Representative for all actions to recover and/or restore operations in the affected area.

The order was terminated on May 7, 2010. Conditions that contributed to the accident no longer exist and normal operations can resume.

Citation No. 6097429 was issued on July 22, 2010, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 56.9101:

A fatal accident occurred at this mine on May 5, 2010, when a miner was struck by a rubber tired drill. The operator was not maintaining control of the equipment while it was in motion. The contractor engaged in aggravated conduct constituting more than ordinary negligence in that he was aware of the practice used to move the drill. The drilling company's policy facilitated the operator's loss of control of the moving machine. This violation is an unwarrantable failure to comply with a mandatory standard.

This citation was terminated on August 5, 2010, after contractor management established safe operating procedures and trained all operators regarding the procedures.

Order No. 6086745 was issued on June 9, 2009, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 46.3(a):

A fatal accident occurred at this mine on May 5, 2010, when a miner was struck by a rubber tired drill. The operator was not maintaining control of the equipment while it was in motion. The contractor engaged in aggravated conduct constituting more than ordinary negligence in that the task training provided to the victim was inadequate. The contractor was aware of the unsafe practices used to move the drill. This violation is an unwarrantable failure to comply with a mandatory standard.

This citation was terminated on August 5, 2009, after contractor management established safe operating procedures and trained all miners regarding the procedures.

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

APPENDICES

A. Persons Participating in the Investigation
B. Victim Data Sheet

APPENDIX A

Persons Participating in the Investigation

Chemical Lime Company of Alabama LLC

William Rogers	Mine Manager
Roger Hickam	Maintenance Supervisor
Bonnie Davis	Regional Safety Manager
Clifford Taylor	Safety Supervisor

C & W Drilling

Donald Deason	Lead Drill Operator
Randy Couch	Drill Supervisor
Woody Quinn	Owner

Mine Safety and Health Administration

Curtis G. Roth	Supervisor Mine Safety and Health Inspector
Raymond J. Norwood	Mine Safety and Health Inspector
Alan R. Coburn	Supervisor Education Field Services
Ronald Medina P.E.	Mechanical Engineer

APPENDIX B

Victim Data Sheet