MAI-2016-09

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 Powered Haulage Accident
June 27, 2016

Atlas Quarries
Atlas Qu Pt Crusher #1
Cord, Independence County, Arkansas
Mine ID No. 03-01720

Robert D. Seelke
Supervisory Mine Safety and Health Inspector

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Originating Office
Mine Safety and Health Administration
South Central District
1100 Commerce Street Room 462
Dallas, Texas 75242-0499
Michael A. Davis, District Manager

OVERVIEW

On June 27, 2016, Billy L. Cude, Superintendent (age 61), was killed when the haul truck he was operating traveled over the edge of the highwall. Cude was using the haul truck to transport material to be used in the construction of a ramp.

The accident occurred due to management's failure to provide berms, bumper blocks, safety hooks, or similar impeding devices at dumping locations where there was a hazard of over travel or overturning.

GENERAL INFORMATION

Atlas Qu Pt Crusher #1 (Atlas Qu), a surface limestone operation owned and operated by Atlas Quarries, is located approximately two miles north of Cord, Independence County, Arkansas. The principal official was Mark Lamberth, President. The mine operates one, eight-hour shift, five days a week. Total employment is thirteen persons.

The operator strips overburden using an excavator. Material is drilled and blasted using a benching method. Limestone is loaded into trucks and transported to an onsite crushing plant where the material is crushed and sized for use in the construction industry.

The Mine Safety and Health Administration (MSHA) conducted its last regular inspection on February 24, 2016.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, Billy L. Cude, (victim) arrived at the mine at 6:45 a.m. At 7:00 a.m., he held a safety meeting with employees. After the meeting, he worked on paperwork and made rounds through the quarry and plant. After lunch, he asked mine mechanic, Jackie Mullen, if the Caterpillar D250 haul truck, Company #260, was fixed and ready to operate. Mullen told Cude the truck was repaired and ready. Cude hauled one load of material to the top of the bench area where a ramp was being constructed. He backed part way down the existing ramp and dumped the load. Danny Mitchell, General Manager, was operating a front end loader on the top of the highwall assisting in the construction of the ramp. Cude attempted to contact Mitchell by CB radio to see if additional material was needed. Due to poor radio communication, he could not hear Mitchell tell him he did not need any more material, and he returned to the plant area for another load. After being loaded, Cude returned to the top of the bench area and backed down the ramp. Mitchell got his attention and waved him off to not dump the load. Cude pulled up to the ramp and stopped. At 2:15 p.m., after sitting there for a few seconds, the truck rolled backwards down the ramp and went over the highwall. Brandon Bailey, Truck Driver, Mullen, and Mitchell, witnessed the truck going over the highwall. The witnesses said they saw Cude with both hands on the steering wheel, looking straight ahead.

Wesley Smith, Pit Loader Operator, was the first to arrive at the truck after the accident and found Cude suspended upside down in the cab with his seatbelt on. He checked for vital signs but found none. The operator called EMS, Arkansas Fire Department, the Batesville Fire Department and the Independence County Deputy. After arriving and assessing the scene, the Independence County Coroner pronounced Cude dead at 3:20 p.m. The cause of death was attributed to multiple injuries.

INVESTIGATION OF THE ACCIDENT

Amanda Stevens with the Human Resource Department for Atlas Quarries notified MSHA of the accident at 2:28 p.m. on June 27, 2016, by a phone call, to the Department of Labor National Contact Center (DOLNCC). The DOLNCC notified Nick Gutierrez, Safety Specialist, South Central District. MSHA issued an order under the provisions of 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 reviewed documents and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management and employees, and Riggs CAT, the local Caterpillar dealer for the truck involved in the accident.

DISCUSSION

Location of the Accident

The accident occurred at the northwest bench of Atlas Qu. The ramp under construction on the bench was generally hard packed rocks and dirt with minor ruts. The ramp extended down toward the top edge of the high wall at a slope of approximately 21%.

Equipment Involved in the Accident

The truck involved in the accident was a Caterpillar D250E, Articulated Truck, Serial Number 5TN00692, manufactured in 1996. The truck was approximately 33' long, 9' wide, and 11' high. The truck consisted of a tractor unit and a trailer unit. The truck had six-wheel drive with one axle on the tractor unit and two axles on the trailer. The truck was powered by a Caterpillar Model 3306, six cylinder, turbocharged, diesel engine. The transmission had five forward speeds and two reverse speeds. The truck's rated load capacity was 25 tons and its approximate gross vehicle weight was 48 tons.

The truck incurred substantial damage due to the accident. Nearly all of the damage occurred to the tractor portion of the machine. The engine was torn out of the truck and the transmission and transfer cases were cracked and pushed back into the tractor's frame. The front axle mounts were broken and the left front tire was knocked off of its rim. The left side suspension components were broken. The investigation team observed significant damage to hydraulic hoses and electrical wires. The Roll-Over Protection Structure, or ROPS, sustained considerable damage but did not collapse significantly into the space normally occupied by the operator. The operator's compartment was severely damaged with the dashboard broken away from the firewall and the steering wheel bent and pushed toward the seat. No significant damage was noted to the trailer portion of the machine, although several tires sustained impact damaged from the accident.

The transmission selector was found in the 1st gear, forward position and the park brake was found in the un-applied position. The position of these controls could have been altered due to the accident or recovery of the victim.

The mechanical linkage between the accelerator pedal and the engine was broken away from the engine. The operation of the accelerator pedal could not be evaluated.

The investigation team was not able to reliably determine the operation of the controls prior to the accident. The operator was wearing the seat belt at the time of the accident.

BRAKE SYSTEM DESIGN

The truck was equipped with separate service brake systems for the tractor and trailer sections of the machine. The service brakes were hydraulically activated, caliper disc brakes. Two calipers were provided at each wheel on the tractor axle and single calipers were provided at each wheel on the 2 trailer axles. The service brakes were modulated by a pedal in the operator's compartment. The parking brake consisted of spring-applied, hydraulic pressure-released wet discs mounted in the transfer case. The unmodulated parking brake was activated by pulling out a button located on the dash in the operator's compartment. A secondary brake system could be applied using the parking brake control. This system applied both the parking brake and the tractor service brakes when the machine was moving or when the transmission was not in neutral.

The service brake systems were supplied with hydraulic pressure from two engine driven piston (implement) pumps. A third ground drive pump supplied hydraulic pressure for emergency steering. In case of engine failure and loss of hydraulic pressure from the engine driven pumps, accumulators provided hydraulic pressure, through independent circuits, for the tractor and for the trailer service brakes. These accumulators were designed to provide nine successive applications of the service brakes at full brake application pressure.

Caterpillar certified the service and parking brakes' performance to SAE J1473 Oct90 and ISO 3450-1985. This was specified in the Caterpillar sales information for the truck. Under these standards, the service brakes are capable of stopping and holding on at least a 25% grade and the parking brake is capable of holding on a minimum 15% grade. The truck was on an approximate 21% grade at the time of the accident. Caterpillar provided information that the parking brake certification tests found that the parking brake would hold the fully loaded truck up to a 27% grade.

Caterpillar's Operating Techniques specify that the parking brake is to be applied and the transmission placed in neutral prior to dumping. It also advises drivers to avoid dumping on steep slopes. While the grade holding ability of properly functioning service and parking brakes would have been adequate considering the truck was only on a 21% grade, the location of the truck - positioned uphill and close to the top edge of the highwall - make this dump site unacceptably dangerous. During post-accident

interviews, mine personnel stated that they refused to dump at sites that sloped toward the edge because of the recognized hazard. Only the two mine managers would operate the truck in these areas.

BRAKE SYSTEM EVALUATION AND TESTS

Due to the damage to the truck, the accident investigation team could only evaluate the function of the brake system by inspecting/testing components. The team evaluated the following components:

- All of the individual brake pads and discs were inspected. All of the discs appeared to be in good condition with no significant rust. All of the brake pads appeared to be in good condition with no sign of oil contamination.

- The brake lines to the trailer axles were intact over the length of the trailer and up to a point on the tractor where they were damaged. A hydraulic hand pump was attached to the brake line to the trailer brakes at this location and pressurized. No leaks were observed. Without pressure, all of the rear wheels could be turned by hand. Once the trailer brake system was pressurized, the wheels could no longer be turned by hand. The trailer brake lines and pistons appeared to function properly.

- The brake lines to the front axle were broken at several locations and could not be tested.

- There was a brake low pressure switch connected to the service brake valve. This switch monitored the brake system pressure and was designed to activate visual and audible warnings. These signals alert the driver that a dangerous fault in the service brake system may have developed and that the truck must be immediately stopped and the fault corrected. The brake low pressure switch was tested for proper operation by checking the continuity of the switch. The Caterpillar manual states that the switch is normally closed when the service brake pressure is at least 1670 psi and opens when the brake system pressure falls below 1670 psi. With no pressure to the switch, the contacts were closed. This test revealed that the switch was defective. The correct Caterpillar part, number 7U9037, was present on the switch. Based on information from the Riggs CAT mechanic discussed below, the investigation team concluded that the switch was defective at the time of the accident.

- The investigation team did not conduct performance tests of the parking brake due to damage to the transmission and transfer case where the parking brake was located. The parking brake was disassembled. No damage was observed and the parking brake discs met the CAT dimensions for new discs. The investigation team concluded that no problems existed with the parking brake at the time of the accident.

- The dashboard Electronic Monitoring System display lights were removed from the accident truck and installed in the second D250E truck at the mine. The display light alarm for the brake low pressure warning illuminated with no pressure in the system. This indicated that the light was not defective prior to the accident. The audible warning alarm was inspected. The positive lead to the alarm had been cut. When provided with power the alarm did sound. It did not appear that the wire was cut due to the accident.

The mechanic reported the service brake low pressure switch indicated a fault condition for some time. Additionally, the low pressure warning light on the dash constantly flashed. This became annoying and the light was reportedly covered with tape by the mine mechanic. Since a low brake pressure is a critical warning for safe operation of the service brakes, the CAT manual specifies that the machine be immediately shutdown until the cause has been corrected. The Riggs CAT mechanic stated he identified the constant flashing of the warning light during his repair work. He noted that since the brake pressures were correct, a replacement switch was needed. He reportedly told the mine mechanic not to operate the truck until the switch was replaced and stated that the truck was tagged out-of-service when he left the mine.

The new low pressure switch was not installed in the truck prior to the truck being placed back in operation. At the time of the accident, the low pressure switch was defective. There is no indication that the service brake pressure was low at the time of the accident. The defective switch is not considered to have contributed to the accident. In addition to the service brake low pressure warning light, a warning alarm also sounds. As previously noted, the positive lead to the alarm had been cut.

SUMMARY

Although defects in the service brake system were found to exist at the time of the accident, i.e. tape over the low brake pressure warning light, cut lead to audible warning device, and a defective low brake pressure switch, these defects are not considered to have contributed to the accident. No braking system or other machine defects were found that would have contributed to the accident.

Weather

The weather on the day of the accident was partly cloudy. The weather was not considered to be a contributing factor in the accident.

TRAINING AND EXPERIENCE

Billy Cude (victim) had twenty-five years of experience, all at this mine. A representative of MSHA's Educational Field and Small Mine Services staff conducted a review of training records and found them to be in compliance with MSHA Part 46.

ROOT CAUSE ANALYSIS

The investigators conducted a root cause analysis of this accident and identified the following root cause and corresponding corrective action to prevent a recurrence of the accident:

Root Cause: Management did not ensure that dump site restraints were provided at the dump site.

Corrective Action: The mine operator installed berms along the edge of the highwall where the accident occurred. The mine operator conducted training on haulage procedures and related safety standards with all miners. The training included inspection of dump sites, location and construction of berms as well as other dump site restraints.

CONCLUSION

The accident occurred due to the management's failure to construct highwall drill ramps properly which resulted in no berms or similar impeding device at a dump site. Additionally the haul truck was operating on a ramp of 21% grade with no barrier to prevent over travel.

ENFORCEMENT ACTIONS

Issued to Atlas Quarries

Order No. 8967054 – Issued under the provisions of section 103(k) of the Mine Act.

> *An accident occurred here at the quarry where a Caterpillar D250E haul truck traveled over the approximately ninety foot high wall. A verbal 103k order was issued by MSHA inspector that was on-site. This order is issued to assure the safety of all persons at this operation. It prohibits all activity at this mine until MSHA has determined that it is safe to resume normal mining operations at the mine. The mine operator shall obtain prior approval from an authorized representative for all actions to recover and /or restore operation to the quarry.*

Citation No. 6566873 - Issued under provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 56.9101:

> *A fatal accident occurred at this operation on June 27, 2016, when a loaded haul truck traveled over the edge of the highwall. The operator of the haul truck did not maintain control of the equipment while it was in motion.*

Order No. 6566874 - Issued under provisions of Section 104(d) of the Mine Act for a violation of 30 CFR 56.9301:

> *A fatal accident occurred at this operation on June 27, 2016, when a loaded haul truck traveled over the edge of the high wall. There were no berms, bumper block or other impeding devices to prevent over travel were the truck was to dump its load. Danny Mitchell, General Manager, engaged in aggravated conduct constituting more than ordinary negligence in that he was aware that there was no dump site restraints at the dump location and allowed this condition to exist. This violation is an unwarrantable failure to comply with a mandatory standard.*

Approved: _____ *Date:* 12/05/16

Michael A. Davis
District Manager

APPENDIX A

Persons Participating in the Investigation

Atlas Quarries

Danny Mitchell	General Manager
Jackie Mullen	Mine Mechanic

Mine Safety and Health Administration

Robert Seelke	Supervisory Mine Safety and Health Inspector
Steve Medlin	Mine Safety and Health Inspector
Carl Jones	Mine Safety and Health Inspector
Dwight Shields	Mine Safety and Health Inspector
Leslie Moore	Mine Safety and Health Inspector
James Angel	Mechanical Engineer
Paul Shelby	EFSMS

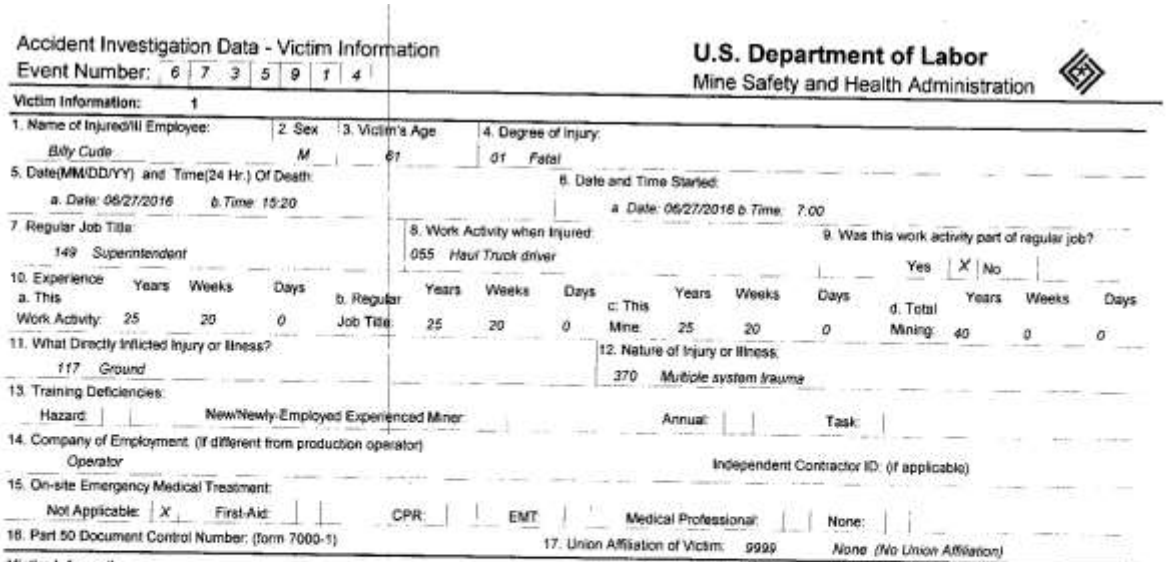
Riggs CAT

Mickey Wilber	Riggs CAT Representative

Barber Law Firm

William Edwards Jr.	Attorney

APPENDIX B



Accident Investigation Data - Victim Information

Event Number: 6 7 3 5 9 1 4

U.S. Department of Labor
Mine Safety and Health Administration

Victim Information: 1

1. Name of Injured/Ill Employee: Billy Cude
2. Sex: M
3. Victim's Age: 61
4. Degree of Injury: 01 Fatal
5. Date(MM/DD/YY) and Time(24 Hr.) Of Death: a. Date: 06/27/2016 b.Time: 15:20
6. Date and Time Started: a. Date: 06/27/2016 b.Time: 7:00
7. Regular Job Title: 149 Superintendent
8. Work Activity when Injured: 055 Haul Truck driver
9. Was this work activity part of regular job? Yes: X No:

10. Experience	Years	Weeks	Days
a. This Work Activity:	25	20	0
b. Regular Job Title:	25	20	0
c. This Mine:	25	20	0
d. Total Mining:	40	0	0

11. What Directly Inflicted Injury or Illness? 117 Ground
12. Nature of Injury or Illness: 370 Multiple system trauma
13. Training Deficiencies: Hazard: New/Newly-Employed Experienced Miner: Annual: Task:
14. Company of Employment (If different from production operator): Operator
Independent Contractor ID: (if applicable)
15. On-site Emergency Medical Treatment: Not Applicable: X First-Aid: CPR: EMT: Medical Professional: None:
16. Part 50 Document Control Number: (form 7000-1)
17. Union Affiliation of Victim: 9999 None (No Union Affiliation)

Appendix C

Persons Interviewed

Scott Broadway …….. Foreman
Mathew Mitchell …….. Truck Driver
Brandon Bailey …….. Truck Driver
Jackie Mullen …….. Mechanic
Bryan Keller …….. Yard Loader Operator
Wesley Smith ……. Pit Loader Operator
Danny Mitchell …….. General Manager
Matt Heath …….. Field Service Mechanic for Rigg's
George Kennedy ……..…… Scale House / Office