MAI-2014-23

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

REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Crushed & Broken Limestone)

Fatal Powered Haulage Accident
December 1, 2014

Mark's Excavating & Trucking
Norwalk, Huron County, Ohio
Contractor ID No. A4724
at
MGQ Aggregates Incorporated
Millersville Quarry
Helena, Sandusky County, Ohio
Mine ID No. 33-04511

Investigators

Sean M. Murphy
Mine Safety and Health Inspector

Michael J. Wynkoop
Mine Safety and Health Inspector

James L. Angel
Mechanical Engineer

Jeffrey A. Hoblick
Mine Safety & Health Specialist (Training)

Originating Office
Mine Safety and Health Administration
Northeast District
178 Thorn Hill Road, Suite 100
Warrendale, Pennsylvania 15086
Donald J. Foster Jr., District Manager


12.01.2014 15:27

OVERVIEW

On December 1, 2014, Darwin O. Glover, Contract Truck Driver, age 46, was killed while operating an articulated haul truck. Glover was traveling along the main quarry haul road and failed to negotiate a curve in the road. The truck traveled over a berm and went into a large pond. Glover drowned in the accident and a rescue diver extricated him from the truck.

The accident occurred due to contractor management's failure to ensure that the victim maintained control of the truck he was operating at all times. An inspection of the truck did not identify any defects and the haul road and berms were in good condition. Glover was not wearing a seat belt.

GENERAL INFORMATION

Millersville Quarry, a surface crushed limestone operation owned and operated by MGQ Aggregates Incorporated, is located in Helena, Sandusky County, Ohio. The principal operating official is Lynn Radabaugh, President. The mine operates one 8-hour shift per day, five days per week. Total employment is eight persons.

A surface lime facility, owned and operated by Carmeuse Lime Inc., is located on the same property. The two operations are physically separated by Ohio State Route 635; however, they are connected by a 1.5-mile long main quarry haul road (see Figure 1). Ponds are located to the north and south of this haul road with water depths ranging up to 45 feet deep.

At the Millersville Quarry, limestone is drilled and blasted from a multiple-bench quarry. An excavator is used to feed the broken limestone into portable plants for crushing and sizing. A front-end loader is used to load the material into haul trucks for transport to Carmeuse Lime Inc.'s plant for further processing. The limestone is heated in kilns and further reduced to produce hydrated lime. The final product is sold for use in the agricultural and cement industries.

Mark's Excavating & Trucking, owned and operated by Mark Schaffer, President, is located in Norwalk, Huron County, Ohio. The company is contracted by MGQ Aggregates Incorporated to perform stripping operations prior to mining in the quarry. Eleven persons work at the mine on one 8-hour shift, five days per week.

The Mine Safety and Health Administration (MSHA) completed the last regular inspection at this mine on April 23, 2014.

DESCRIPTION OF THE ACCIDENT

On December 1, 2014, Darwin O. Glover (victim) reported for work at 6:30 a.m., his normal starting time. Timothy Knoll, Supervisor, instructed Glover to operate an articulated haul truck to transport overburden from the quarry to a reclamation area at Carmeuse Lime Inc.'s facility. Glover began hauling and dumping successive loads of material as instructed. At about

10:30 a.m., Glover dumped a load of overburden at the dump site and was returning to the stripping operation. After making a 90-degree turn, Glover crossed State Route 635 to access the main quarry haul road. He drove eastward approximately 454 feet down a grade of 5 percent and onto a level area where the road turned approximately 36 degrees to the south. In this area, ponds were located on each side of the haul road. Jeremy Briggs, Quarry Superintendent, was traveling in the opposite direction. Briggs noticed Glover's truck was traveling faster than normal speed and crossing over into his lane. Briggs realized that Glover was not going to negotiate the curve.

Glover's truck did not follow the turn but traveled straight approximately 213 feet and impacted the northern berm at a 21-degree angle. The truck then straddled the berm and skidded for approximately 64 feet before the right side wheels rode up and over the berm and the truck entered the pond.

Briggs drove his haul truck to the pond and saw the submerged cab of Glover's truck. Briggs immediately radioed for help and then called 9-1-1 for emergency assistance. At 10:55 a.m., local fire and water rescue services arrived at the site. A rescue diver entered the pond and extricated Glover from the fully submerged truck. Emergency medical services arrived and transported Glover to a hospital where he was pronounced dead. The cause of death was attributed to drowning.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 11:42 a.m. on December 1, 2014, by a telephone call from Jeremy Briggs, Quarry Superintendent, to the National Call Center. The National Call Center notified Joseph M. Denk, Staff Assistant, and an investigation was started the same day. An order was issued under provisions of Section 103(j) of the Mine Act. This order was later modified to Section 103(k) of the Mine Act after the arrival of an Authorized Representative at the mine site. Part 50 citations were issued to Mark's Excavating & Trucking and MGQ Aggregates Incorporated, for untimely reporting.

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 and local law enforcement.

DISCUSSION

Location of Accident

The accident occurred on the main quarry haul road approximately 960 feet from State Route 635 near a 36-degree curve to the south in the haul road. The victim's truck was traveling from west to east. Substantial berms are constructed on both sides along the length of the haul road. The haul road is smooth, consisting of hard-packed limestone, and is approximately 40 feet wide

between the berms. The posted speed limit at the mine and on the main quarry haul road is 25 mph.

The berms consist primarily of limestone rocks ranging in size from 3 inches to 8 inches. The berm height in the area where the truck ran over the berm is approximately 66 inches above the adjacent roadway with a base approximately 17 feet between the roadway and pond. Tire tracks on the berm indicate the left front tire impacted the berm at an angle of approximately 21 degrees. As the result of trucks traveling the road and periodic grading, fine limestone dust had accumulated over time between the base of the berms and the haul road. This created an approximately 30-inch wide and 16-inch high ramp up onto the berms.

Equipment Involved

1. **General Information:** The truck involved in the accident is a 2004 Caterpillar Model 725 Articulated Haul Truck consisting of a tractor unit and a trailer unit. The truck is approximately 32-feet long, 9-feet wide, and 11-feet high and is powered by a 6-cylinder, turbocharged diesel engine. The transmission has six forward speeds and one reverse speed. The operator selects the gear using a shift lever in the operator's compartment. The transmission has an integral hydraulic retarder activated by a lever on the right side of the steering column. The truck has six-wheel drive, with one axle on the tractor unit and two axles on the trailer. The truck's rated load capacity is 26 tons and its approximate gross vehicle weight is 51 tons. Caterpillar specifications for the truck indicate a top speed of 32.1 mph in sixth gear.

2. **Truck Conditions Found:** The truck sustained minor damage due to the accident. Water entered the engine, transmission, and hydraulic systems. The front windshield was broken and the fiberglass cowling behind the operator's compartment was cracked and had pieces broken off. The front skid plate was bent up and the adjacent engine exhaust pipe was bent in and had approximately a ⅜-inch hole in the pipe in this area.

   The positions of the operator's controls were observed and the engine start switch (key) was in the "on" (run) position. The transmission selector lever was in the "1" position. The retarder lever was in the disengaged (off) position. The parking brake was in the pushed-in, disengaged (off) position. The control positions may have been affected during the accident or recovery from the pond.

   The machine was equipped with 23.5R25 radial tires. The rolling radius of the tires, with the truck unloaded, was approximately 28.75 inches and the tread width was approximately 22 inches. The tires were found to be in good to fair condition.

   No significant debris or extraneous items were found in the operator's compartment that would have interfered with the truck's operation. The steering wheel, accelerator, and brake pedal were operated by hand without difficulty.

3. **Event (Fault) Codes at the Time of Accident:** Although the batteries were dead, the truck's Electronic Control Modules (ECMs) and electrical circuits operated properly after the

truck was re-powered. Data from the truck's ECMs were downloaded and the ECM time was recorded in hour increments. The only code possibly related to the accident was for a "Low Steering Pump Pressure" event at transmission hour reading 6032 hours which corresponded to the engine hour reading of 6070 hours. Since numerous other event codes occurred at the same time, this is considered to be the time of the vehicle entered the water. The investigators concluded that the low steering pressure event occurred as a result of the truck entering the water.

4. **Pre-operational Examinations and Maintenance:** Examination and Maintenance records, dating from August 13, 2005, were available and reviewed. In 2014, no pre-operational examination records indicated any problems with the truck. The only steering and braking system defects previously noted were for the parking brake system (in 2013) and steering system (in 2008, 2012, and 2013) low pressure switches. The investigators concluded that these defects did not represent a recurring problem and were not contributing factors in the accident.

   The hydraulic filters for the hydraulic (braking and steering) system were removed and inspected. No significant accumulation of debris was observed on the filters. Maintenance records indicated that the filters had been changed approximately four months prior to the accident.

5. **Repairs Made to Allow Testing:** After the truck was recovered from the water, it was hauled to the contractor's main shop in Norwalk, Ohio. The truck's engine, transmission, and hydraulic systems were drained to remove water and fluids. After new filters were installed and necessary fluids replaced, the engine was restarted to conduct operational testing.

6. **Operator Controls and Testing**: The gear shift lever, park brake control, hoist control, and the retarder lever sent correct signals to the ECM when moved through their various positions. The accelerator pedal appeared to properly control the engine speed after the engine was started. The ECM monitor for the accelerator pedal indicated that pedal's signal to the ECM moved from 0 percent to approximately 95 percent and back to 0 percent as the pedal was fully applied and then released. The accelerator pedal worked as designed.

7. **Braking Systems Design and Testing:** The truck is equipped with a dual system, hydraulic service brake and a spring-applied, hydraulic pressure-released parking brake. The parking brake functions as a tertiary brake if both service braking systems fail. The service braking system activates dry caliper disc brakes on the tractor axle and on the first rear axle. Two calipers are provided on the discs at each wheel. The second rear axle is not designed with service brakes. The park brake system activates a dry caliper disc brake attached to the output drive shaft of the transmission. The park brake acts on both of the trailer axles.

   The service and parking brake systems are supplied with hydraulic pressure from an engine driven piston pump. The hydraulic pressure applies service brakes when the operator activates a foot pedal in the operator's compartment. Hydraulic pressure releases the parking brake when a control button in the operator's compartment is depressed. The parking brake

is applied by pulling the button out. Both systems are provided with a hydraulic accumulator which reduces lag time in application of the service brake and release of the park brake.

Visual inspection of the brake pads and rotors did not reveal any significant defects. After the truck was repaired (as described above) to allow operational brake testing, hydraulic fluid was observed leaking at the front right brake line block that tees in the upper and lower calipers. A line support clamp, approximately 18 inches from the block, was loose and allowed the line to vibrate at the block. The investigators concluded that the slight leak did not affect the capability of the service braking system.

The service brake holding ability was checked with the service brake applied, the transmission in first gear, and the engine speed increased to 1200 rpm and the truck did not move. The service brake met Caterpillar's brake holding ability specifications.

According to Caterpillar specifications, the parking brake is to be tested on a 15 percent grade. Since the truck was taken to the contractor's shop, it could not be tested on a grade. However, when the truck was pulled from the pond, it was found with the parking brake disengaged. The parking brake was subsequently set to prohibit inadvertent movement while the truck was being examined. The investigators noted that when the truck was pulled away from the berm and loaded onto a 'low boy' trailer, all four rear tires skidded. This indicated that for an unloaded truck, as was the case prior the accident, the parking brake had the capability of stopping the truck, if necessary, in the event of an emergency.

8. **Steering System Design and Testing:** The articulated truck frame steering is provided by double-acting hydraulic steering cylinders that provide 45-degree left and right steering. Caterpillar specifies a turning radius of 23 feet 10 inches. Under normal operation, the steering system is provided hydraulic pressure by a piston pump connected to the engine. In the case of loss of primary steering pressure, secondary steering is provided by a battery-driven hydraulic pump. A secondary test switch is located on the instrument panel in the operator's compartment. Using this switch, the secondary steering system was tested at the accident site after installing new batteries in the truck. The secondary steering system worked and no leaks were observed in the steering circuit.

   According to Caterpillar specifications, a steering time test was performed with the engine at high idle while measuring the average time from steering stop to stop when rotating the steering wheel at 60 rpm. The average of 10 tests of the stop to stop times was approximately 4.8 seconds which met the Caterpillar specifications. No damage, leakage, or operational problems were noted with the steering system.

9. **Seat Belt:** The seat belt latched and unlatched when tested.

Weather

On the day of the accident, skies were clear with an average temperature of 34 degrees Fahrenheit with calm winds. Sunrise was at 7:44 a.m. The investigators determined that weather conditions and lighting were not contributing factors in the accident.

Summary

Substantial berms had been constructed on both sides along the length of the entire of the main quarry haul road. The haul road was smooth and approximately 40 feet wide between the berms. The posted speed limit at the mine and on the main quarry haul road was 25 mph. There were no road obstructions or adverse weather conditions. In addition, there were no defects identified with the haul truck's braking systems, steering system, or accelerator. Other than excessive speed, there were no conditions present that would have restricted the ability of the driver to control the truck at the time of the accident.

TRAINING AND EXPERIENCE

Darwin O. Glover had 20 years of experience as a mobile equipment operator. Glover worked for the contractor, primarily as a truck driver, for the past 1½ years, but had worked at the mine for only five days.

A representative of MSHA's Educational Field and Small Mine Services conducted an in-depth review of the contractor's part 46 training records for Glover. The records documented that he had received all required training, including task training on the articulated haul truck that he was operating. He received site-specific hazard training through MGQ Aggregates Incorporated and Carmeuse Lime Inc.

ROOT CAUSE ANALYSIS

The investigators conducted a root cause analysis and identified the following root causes:

Root Cause: Contractor management did not ensure that the victim maintained control of the truck he was operating at all times.

Corrective Action: Contractor management established procedures to ensure that mobile equipment operators maintain control of trucks at all times while operating them. The procedures require that mobile equipment operators obey posted speed limits and maintain safe control of the equipment being operated. All contract truck drivers were trained in these new policies and procedures.

Root Cause: Contractor management policies, procedures, and controls did not ensure the victim wore his seat belt when operating the haul truck.

Corrective Action: All contract truck drivers received additional training regarding the required use of seat belts when operating haul trucks. Management will monitor truck drivers to ensure seat belts are worn.

CONCLUSION

The accident occurred due to contractor management's failure to ensure that the victim maintained control of the truck he was operating at all times. An inspection of the truck did not identify any defects and the haul road and berms were in good condition. Glover was not wearing a seat belt.

ENFORCEMENT ACTIONS

Issued to Mark's Excavating and Trucking

Order No. 8807207 – Issued on December 1, 2014, under the provisions of Section 103(j) of the Mine Act. An Authorized Representative modified this order to Section 103(k) of the Mine Act upon arrival at the mine site:

> *An accident occurred at this operation on December 1, 2014 at approximately 1030 hours. This order is being issued under Section 103(j) of the Federal Mine Safety and Health Act of 1977, to prevent the destruction of any evidence which would assist in investigating the cause or causes of the accident. It prohibits all activity at the area of the main entrance road off Route 635 (haul road) where the accident occurred until MSHA deems that it is safe to resume normal mining operations in this area.*
>
> *This initial order is modified to reflect that MSHA is now proceeding under the authority of Section 103(k) of the Mine Act. This Section 103(k) order is intended to protect the safety of all persons on-site, including those involved in the rescue and recovery operations or investigation of the accident. The mine operator shall obtain prior approval from an authorized representative for all actions to recover and/or restore operations to the affected area. Additionally, the mine operator is reminded of its existing obligations to prevent the destruction of any evidence which would assist in investigating the cause or causes of the accident.*

The order was terminated December 12, 2014, after conditions that contributed to the accident no longer existed.

Citation No. 8804032 – Issued under the provisions of 104(a) of the Mine Act for a violation of 30 CFR 56.9101:

> *A fatal accident occurred at this mine on December 1, 2014. A contract truck driver (victim) was operating an empty articulated haul truck while traveling eastward along the main quarry haul road. The contract driver failed to maintain control of the truck while*

attempting to negotiate a 36 degree curve in the roadway. As a result, the truck impacted and traveled over a berm on the north side of the roadway and entered a pond.

Citation No. 8804033 – Issued under the provisions of 104(a) of the Mine Act for a violation of 30 CFR 56.14131(a):

A fatal accident occurred at this mine on December 1, 2014. A contract truck driver (victim) was operating an empty articulated haul truck while traveling eastward along the main quarry haul road. The victim was not wearing the provided seat belt when he failed to negotiate a 36 degree curve in the roadway. As a result, the truck impacted and traveled over a berm on the north side of the roadway and entered a pond.

Approved: Dennis A Yesko For Donald J. Foster, Jr.
District Manager

Date: 2/13/2015

LIST OF APPENDICES

Appendix A

Persons Participating in the Investigation

MGQ Aggregates Incorporated

Jeremy Briggs	Quarry Superintendent

Mark's Excavating and Trucking

Jason Schaffer	Vice-President
John Landrum	GPS Specialist
Timothy S. Herner	Truck Driver
David W. Sidell	Equipment Operator
Nate Michael	Mechanic
Jon Wilhelm	Mechanic
Edward Moser	Maintenance Supervisor

Caterpillar - Toledo, Ohio

Monte Zimmerman	Safety Manager
Charles Shulte	Field Service Technician

Sandusky County Sheriff Department

Michael Meggitt	Captain

Mine Safety and Health Administration

Sean M. Murphy	Mine Safety and Health Inspector
Michael J. Wynkoop	Mine Safety and Health Inspector
James L. Angel	Mechanical Engineer
Jeffrey A. Hoblick	Mine Safety and Health Specialist (Training)

APPENDIX B

VICTIM INFORMATION

Accident Investigation Data - Victim Information
Event Number: 6 6 8 3 7 6 2

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

Victim Information: 1

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Degree of Injury
Darwin O. Glover	M	46	01 Fatal

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death:
a. Date: 12/01/2014 b.Time: 10:30

6. Date and Time Started:
a. Date: 12/01/2014 b.Time: 10:30

7. Regular Job Title:
076 Truck Driver

8. Work Activity when Injured:
055 Operate Haul Truck (Surface)

9. Was this work activity part of regular job?
Yes X No

10. Experience	Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days
a. This Work Activity:	20	0	0	b. Regular Job Title:	1	26	0	c. This Mine:	0	0	5	d. Total Mining:	1	26	0

11. What Directly Inflicted Injury or Illness?
126 Water, Truck entering pond

12. Nature of Injury or Illness:
110 Drowning

13. Training Deficiencies:
Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task:

14. Company of Employment: (If different from production operator)
Mark's Excavating & Trucking

Independent Contractor ID: (if applicable) A4724

15. On-site Emergency Medical Treatment:
Not Applicable: | First-Aid: | CPR: | EMT: X | Medical Professional: | None:

16. Part 50 Document Control Number: (form 7000-1)

17. Union Affiliation of Victim:

APPENDIX C

Accident Scene Photos

Figure 1 – Aerial View of MGQ Aggregates Incorporated and Carmeuse Lime Inc. showing the Accident Site on the main quarry haulage road approximately 960 feet east of State Route 635.

Figure 2 – Photo of the Victim's Truck showing accident-related damage.