MAI-2013-08

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

REPORT OF INVESTIGATION

Underground Metal Mine
(Gold Ore)

Fatal Powered Haulage Accident
June 2, 2013

Newmont USA Limited
Exodus
Carlin, Eureka County, Nevada
Mine ID No. 26-02661

Investigators

Joel L. Dozier
Mine Safety and Health Inspector

Charles Snare
Mine Safety and Health Inspector

Ronald Medina
Mechanical Engineer

Joseph N. Rhoades
Mine Safety and Health Specialist

Originating Office
Mine Safety and Health Administration
Western District
991 Nut Tree Road
Vacaville, California 95687
Wyatt S. Andrews, District Manager

OVERVIEW

On June 2, 2013, Corey Vasquez, Load Haul Dump (LHD) Operator, age 43, was killed when the LHD he was operating overtraveled the edge of a stope and fell approximately 40 feet into an open hole. Vasquez was assigned to build a berm, using cemented rock fill material (CRF), in front of the open stope. He used the LHD to pick up a bucket full of CRF and traveled around a 128 degree left hand turn when the LHD went into the open hole.

The accident occurred due to management's failure to ensure that the established standard operating procedures to provide a safe work area near the stope were being followed by persons performing the work. Persons were not protected from overtravel while operating equipment near the open stope. Visual markers, used to identify the opening, had not been put into place to warn of a hazardous condition. Berms, bumper blocks, or similar impeding devices were not provided at the edge of the open stope where there was a hazard of overtravel.

GENERAL INFORMATION

Exodus, a multi-level, underground gold mine, owned and operated by Newmont USA Limited, is located approximately 25 miles north of Carlin, Eureka County, Nevada. The principal operating official is Timothy Pike, Manager of Portal Underground Operations. The mine operates two 12-hour shifts per day, seven days per week. Total employment is 104 persons.

Gold bearing ore is drilled and blasted in long hole stopes. Broken material is transported from the bottom of the stopes with diesel powered LHDs and haul trucks to surface stockpiles for processing and refining. The finished products are sold to commercial industries.

The Mine Safety and Health Administration (MSHA) completed the last regular inspection at this operation on May 1, 2013.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, Corey Vasquez, victim, reported for work at 6:00 p.m., his normal starting time. Blaze White, Shift Supervisor, gave a safety talk to the crew and then provided work assignments for the shift. Vasquez traveled underground to the 4500-310 stope to start back filling that stope. At approximately 7:35 p.m., White called

Vasquez on the radio and told him to build a berm at the opening near the 4770-315 stope because the previous shift had blasted that stope at the end of their shift. White then instructed Dustin Nostrom, Miner, to remove a concrete stope bumper block, that was placed near the opening of the 4770-315 stope, in preparation to install the berm. Vasquez called on the radio for two truckloads of the CRF material. One truck load was delivered and dumped.

At 8:00 p.m., Nostrom saw Vasquez sitting in the LHD near the 4770-315 stope. At 8:10 p.m., Timothy Morgan, Miner, drove by the 4770-315 stope and heard the backup alarm on the LHD but did not see the machine or any lights. He walked toward the stope and saw the LHD's lights in the open hole. Morgan immediately used a radio to call White to inform him of the accident. Morgan and Nostrom got Sala blocks (fall protection) so they could look over the edge of the opening. Attempts were made to get a response from Vasquez but he was unresponsive.

At 8:18 p.m., White called the surface shop to have the mine rescue team activated. They arrived at the stope at 9:15 p.m. but due to hazardous ground conditions, they did not attempt to enter the stope from the top.

Management developed a plan to draw the shot material below from the 4680-315 stope. The LHD was pulled out into the 4680-315 stope at 5:10 a.m. on June 3, 2013. Vasquez was pronounced dead at 7:00 a.m. on June 3, 2013, by Kenneth Jones, Eureka County Sheriff/Coroner. The cause of death was attributed to multiple blunt force trauma injuries.

INVESTIGATION OF THE ACCIDENT

On the day of the accident, MSHA was notified at 8:54 p.m. by a telephone call from Randy Squires, Senior Regional Manager Safety Relations, to Gary Hebel, Supervisory Mine Safety and Health Inspector, Elko Field Office, and an investigation was started the same day. To ensure the safety of all persons, an order was issued under the provisions of section 103(j) of the Mine Act. This order was later modified to section 103(k) of the Mine Act after an Authorized Representative arrived at the mine site.

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, the State of Nevada Mine Safety and Training Section, and the Eureka County Sheriff's Department.

DISCUSSION

Location of the Accident

The accident occurred on the 315 drift on the 4700 level of the mine at the 4770-315 level top cut stope. The drift dimensions were 18 feet across the sill and 16 feet to the back. The overall length of the opening in the 4700-315 stope was approximately 44 feet.

The last three production rings had been shot on the previous shift. Vasquez was assigned to build a berm, using CRF material, while the previously shot ore was being removed below from the 4680-315 stope. The berm was being installed in preparation for future backfilling of the 4770-315 stope.

Mining Method

During the production process, a sill drift was driven horizontally and a second one was driven below the first (commonly referred to as the top cut and bottom cut, respectively). The 4700-315 stope consisted of the top cut on the 4700 level and the bottom cut on the 4680-315 level. The two levels were connected by drilling vertical blast holes from the end of the 4700-315 stope on the top cut to the bottom cut. Each row of holes from rib to rib was called a ring. Each shot consisted of several rings, beginning at the face, working outward toward the entry.

The last three rings of holes were shot to develop an opening that allowed material to flow down to the bottom cut. The material was then mucked on the bottom cut and transported to the surface for processing.

Load Haul Dump

The Load Haul Dump (LHD) involved in the accident was a Caterpillar R1600. It was an articulated loader with a nominal payload capacity of 22,490 pounds. The operator's compartment was located on the left side of the machine with the operator seated transversely to the direction of travel. The four-wheel drive LHD was powered by a Caterpillar 3176C, 10.3 liter, turbocharged diesel engine. It was equipped with a four-speed transmission for both the forward and reverse directions; however, fourth gear was electronically locked out, thus allowing shifts only up to third gear in both the forward and reverse directions.

As specified by Caterpillar, the maximum speed (with 18.00-25 tires) in Forward 1 was 3.2 mph; in Forward 2, 5.7 mph; in Forward 3, 10.2 mph; and in Forward 4 (locked out and not applicable for this machine), 17.8 mph. The maximum rated speeds in reverse were 3.6 mph, 6.5 mph, 11.5 mph, and 19.8 mph (locked out) for the four gear speeds.

Operating Controls Description

The LHD was equipped with a Caterpillar STIC Steering Control which combined directional selection, gear selection, and steering into a single joystick type lever. Side-to-side motion turned the machine left or right. Transmission shifting (forward, neutral, reverse) was controlled using a three position rocker switch.

A rotational control switch mounted on the dashboard panel allowed the operator to select one of four gear selection positions: "manual", 4th, 3rd, or 2nd. In the "manual" mode, the operator controlled all upshifts and downshifts with two thumb operated push buttons mounted on the STIC Steering Control, one button for upshifts and one button for downshifts. If the transmission control was placed into the 4th, 3rd, or 2nd position, the transmission automatically shifted as needed but would limit the highest gear to that indicated by the switch position. Since 4th gear was locked out, the transmission would only shift up to 3rd gear even if 4th gear was selected.

Two headlight switches were located on the dashboard, one for the front lights and one for the rear lights.

Control Positions

The LHD was traveling in the forward direction when it entered the open stope. Some loose rock fell into the cab as a result of the accident. The transmission rocker switch was found to be set for the reverse direction of travel and the transmission rotary control switch was found in the 2nd gear position. The throttle pedal, service brake pedal, and neutralizer pedal all moved freely and spring-returned upon release when tested. The Caterpillar STIC Steering Control operated freely and spring returned to the center position upon release. The front headlight switch and the rear headlight switch were found in the "on" position.

Brake System Design

The LHD was equipped with full hydraulic, enclosed, wet disc service brakes at each wheel and spring-applied, hydraulic-released parking brakes at each wheel. Both the service brake and parking brake used the same brake discs and reaction plates inside each wheel unit to develop the friction force to stop and hold the machine.

The service brake could be applied using either of two brake pedals. The service brake pedal was located to the left of the throttle pedal in standard automotive orientation. The service brake/transmission neutralizer pedal was located farther to the left. Pushing down the service brake/transmission neutralizer pedal shifted the transmission into neutral in addition to applying the service brake.

The LHD was equipped with two gas-charged, piston type accumulators, one for the front axle and one for the rear axle. The accumulators were pressurized by a hydraulic pump and a brake accumulator charging valve designed to maintain a pressure between 1,700 psi and 2,100 psi in each accumulator.

From the accumulators, the oil flowed to the service brake control valve. The service brake control valve was a tandem valve that reduced the pressure and directed oil to both the front and rear axle service brakes when either brake pedal was depressed. According to Caterpillar, when the service brake was fully applied and the accumulator charging oil was at full operating pressure, the pressure delivered to the wheel brakes was designed to be 850 +/- 50 psi.

The parking brake was manually applied and released using a push-pull button on the dashboard that operated the parking brake solenoid valve. The parking brake was also designed to automatically apply when the machine was shut down or when the brake system oil pressure was low (below 1,200 psi.)

Brake System Testing

The LHD was damaged in the accident and the engine could not be operated. Since stopping performance tests could not be performed, service brake pressure tests were conducted. The hydraulic tank was not damaged in the accident. After the recovery of the machine, the oil level remained in the normal operating range. The brake accumulators on the LHD were charged using a Caterpillar battery powered porta-power.

The porta-power was able to charge the accumulators to 1,500 psi which was slightly below the full operating pressure range of 1,700 to 2,100 psi. When either the brake or brake/neutralizer pedal was pushed down, the pressure delivered to the front and rear axle service brake lines was approximately 800 psi which was within the normal operating range specified by the manufacturer.

During the recovery of the machine, the friction capacity of the brake discs and reaction plates was shown to be sufficient. The parking brake was applied and when the LHD was pulled by a larger vehicle, three of the tires on the LHD skidded, indicating there were no defects with the parking/service brake discs and reaction plates that developed the friction force to stop and hold the machine. Investigators could not safely observe if the fourth tire skidded or not.

No service brake or parking brake defects were found.

Lighting System and Operator's Field of View

The LHD was equipped with five headlights facing the forward direction of travel. The headlight electrical wiring was damaged in the accident so each headlight was tested individually by applying 24 volts to the headlight terminals. There was one headlight on the right lift arm and it had been torn off due to the accident. When tested, three of the five light-emitting diodes (LEDs) that comprised this headlight functioned.

A second light, located behind the right lift arm was completely crushed and could not be tested. Another headlight, located on the left lift arm, was tested and all five of the LEDs in this headlight functioned. The headlight on the top right corner of the cab had also been torn off, but all 6 LEDs functioned when 24V was applied. A single halogen type headlight, recessed into the outside edge of the cab, functioned when tested. The switch for the front headlights also functioned to open and close the circuit when tested with a voltmeter.

The forward direction field of view, for a six foot tall operator seated in the operator's seat, was evaluated. With the bucket empty and lowered in a carrying position, the ground level was not visible at distances less than 34 feet from the front edge of the machine's bucket.

CAT Electronic Monitoring System

The Cat Electronic Monitoring System on the machine was accessed and indicated the machine was electronically configured to limit the maximum forward and reverse gears to 3rd.

The back-up alarm functioned when tested. No visible steering system defects were found.

Summary

The braking system and lighting system were tested. The steering system was visually examined. No machine defects were found that contributed to the accident. The seat belt latched and unlatched when tested.

Established Operating Procedures

Management had an established procedure in place regarding persons working near open stopes. The written procedure required that "Do Not Enter" streamers were to be placed ten feet from the edge of an open hole and a cement berm or anchored block was required to be maintained a minimum of five feet back from the edge of an open hole at all times.

After the accident, investigators found streamers, that were placed after the most recent blast, about 18 feet from the leading edge of the stope. The cement berm or anchored block that was to be maintained a minimum of five feet back from the edge of the open hole at all times as required, was removed just prior to the accident.

Training and Experience

Corey Vasquez (victim) had 2 years and 18 weeks mining experience. He had 1 year, 32 weeks at his current job as an LHD operator. A representative of MSHA's Educational Field Services staff conducted an in-depth review of the mine operator's training records. The training records for Vasquez were reviewed. All of his required MSHA training, including annual refresher training and task training, was found to be up to date and in compliance with MSHA requirements.

ROOT CAUSE ANALYSIS

Investigators conducted a root cause analysis and identified the following root cause:

Root Cause: Management failed to ensure that the established standard operating procedures to provide a safe work area near the stope were being followed by persons performing the work. A bumper block or similar impeding device was not used while the berm was being constructed at the open hole in the stope. Visual open hole streamers or reflective poles were not in place to identify the location of the opening. Streamers from a previous blast cycle had been left in place; however, they were 18 feet from the leading edge of the opening.

Corrective Action: Management reviewed the standard operating procedures for backfilling open stopes. The standard operating procedures have been modified to ensure that "Danger Open Hole" signs and streamers are posted ten feet from the edge of an open stope. CRF berms will be installed using remote equipment or a bumper block will be in place until a CRF berm is constructed and allowed to cure. All of the miners were trained regarding these new standard operating procedures.

CONCLUSION

The accident occurred due to management's failure to ensure that the established standard operating procedures to provide a safe work area near the stope were being followed by persons performing the work. Persons were not protected from overtravel while operating equipment near the open stope. Visual markers, used to identify the opening, had not been put into place to warn of a hazardous condition. Berms, bumper

blocks, or similar impeding devices were not provided at the edge of the open stope where there was a hazard of overtravel.

ENFORCMENT ACTIONS

Issued to Newmont USA Limited

Order No. 8700966 -- issued on June 2, 2013, 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 06/02/2013 at approximately 20:50 hrs. As rescue and recovery work is necessary, this order is being issued, under Section 103(j) of the Federal Mine Safety and Health Act of 1977, to assure the safety of all persons at this operation. This order is also being issued 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 4770-4680 315 stope except to the extent necessary to rescue an individual or prevent or eliminate an imminent danger until MSHA has determined that it is safe to resume normal mining operations in this area. This order applies to all persons engaged in the rescue and recovery operation and any other persons on-site. This order was initially issued orally to the mine operator at 21:00 hrs. and has now been reduced to writing.*

The order was terminated after conditions that contributed to the accident were corrected allowing normal mining operations to resume.

Citation No. 8696735 -- issued under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 57.9301:

> *A fatal accident occurred at this operation on June 2, 2013, when a Load Haul Dump (LHD) the victim was operating fell approximately 40 feet into the open 4770-315 stope. Berms, bumper blocks, or similar impeding devices were not provided at the edge of the open stope where there was a hazard of overtravel. Prior to the accident, the shift supervisor had directed a miner to remove a concrete bumper block from the edge of the open stope and failed to take any other steps to prevent the LHD from overtravel. The shift supervisor engaged in aggravated conduct constituting more than ordinary negligence in that he failed to ensure that all safety precautions were in place prior to beginning work in the area. This violation is an unwarrantable failure to comply with a mandatory standard.*

Citation No. 8696736 -- issued under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 57.9100(b):

A fatal accident occurred at this operation on June 2, 2013, when a Load Haul Dump (LHD) the miner was operating fell approximately 40 feet into the open 4770-315 stope. No signs or signals that warn of hazardous conditions were placed near the edge of the open stope. The shift supervisor engaged in aggravated conduct constituting more than ordinary negligence in that he entered the 4770-315 stope to conduct a post blast inspection and failed to ensure that a sign or signal warning of a hazardous condition was in place prior to persons beginning work in the area. This violation is an unwarrantable failure to comply with a mandatory standard.

Approved By: Wyatt Andrews

Wyatt S. Andrews
District Manager

Date: 9/19/2013

APPENDIX A

Persons Participating in the Investigation

Newmont USA Limited

Randy Squires	Senior Regional Manager Safety Relations
Ronald Jensen	HSLP Representative

Eureka County Sheriff's Department

Kenneth Jones	Sheriff
Michael Harter	Deputy Sheriff

State of Nevada Mine Safety and Training Section

Michael Anderson	Mine Inspector

Mine Safety and Health Administration

Joel Dozier	Mine Safety and Health Inspector
Charles Snare	Mine Safety and Health Inspector
Joseph Rhoades	Mine Safety and Health Specialist
Ronald Medina	Mechanical Engineer

APPENDIX B

Accident Investigation Data - Victim Information
Event Number: 1 1 5 7 8 7 6

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:
Corey L. Vasquez	M	43	01 Fatal

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death:	6. Date and Time Started:
a. Date: 06/03/2013 b.Time: 7:00	a. Date: 06/02/2013 b.Time: 15:00

7. Regular Job Title:	8. Work Activity when Injured:	9. Was this work activity part of regular job?
026 LHD Operator	060 Operating LHD	Yes X No

10. Experience	a. This Work Activity:	b. Regular Job Title:	c. This Mine:	d. Total Mining:
Years	1	1	2	2
Weeks	32	32	16	16
Days	0	0	0	0

11. What Directly Inflicted Injury or Illness?	12. Nature of Injury or Illness:
077 Underground Mining Machine	390 Multiple Blunt Force Trauma

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

14. Company of Employment: (if different from production operator)
Operator

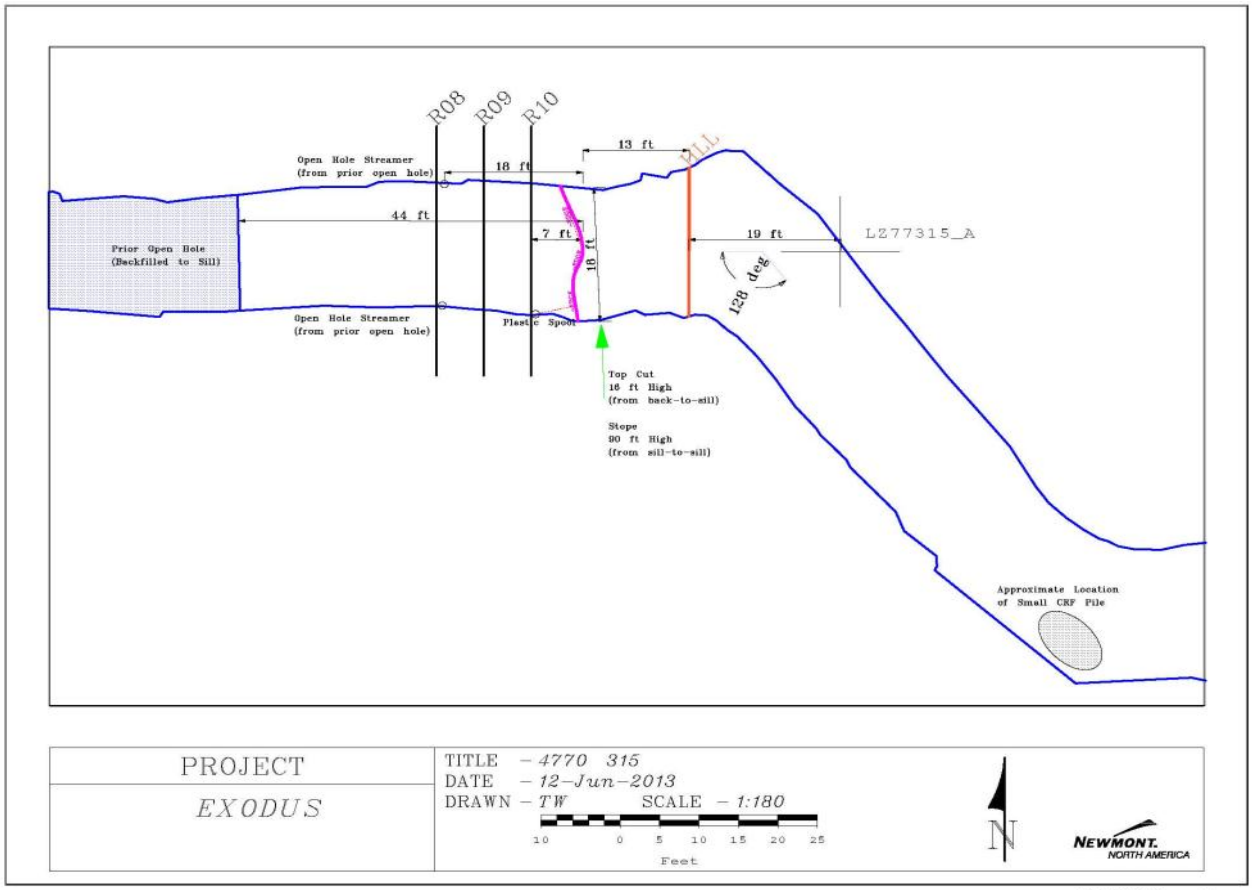
Independent Contractor ID: (if applicable)

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

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

17. Union Affiliation of Victim: 2670 Operators Union

APPENDIX C


R08
R09
R10
13 ft
18 ft
44 ft
7 ft
18 ft
19 ft
128 deg
LZ77315_A
Open Hole Streamer
(from prior open hole)
Prior Open Hole
(Backfilled to Sill)
Open Hole Streamer
(from prior open hole)
Plastic Spool
Top Cut
16 ft High
(from back-to-sill)
Stope
90 ft High
(from sill-to-sill)
Approximate Location
of Small CRF Pile
PROJECT
EXODUS
TITLE – 4770 315
DATE – 12-Jun-2013
DRAWN – TW
SCALE – 1:180
10 0 5 10 15 20 25
Feet
N
NEWMONT.
NORTH AMERICA
EXVAS00337