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 Stone

Fatal Powered Haulage Accident June 13, 2013

Stevens Creek Quarry Inc.
Stevens Creek Quarry
Cupertino, Santa Clara County, California
Mine ID No. 04-01676

Investigators

Chad Hilde Mine Safety and Health Inspector

> Fred T. Marshall Mechanical Engineer

Norman Zeman Supervisory Mine Safety and Health Specialist

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



OVERVIEW

On June 13, 2013, Jose A. Gonzalez Sr., Lead Mechanic, age 49, was killed when the haul truck he was driving went out of control, struck a berm, and was propelled into the air. The haul truck came to a stop with the bed overturned and the cab upright. The victim was ejected from the haul truck.

Prior to the accident, the haul truck had been located on a steep, temporary ramp leading up to an area that was being cleared for quarry expansion. Jaime Bethard, Truck Driver, had backed the haul truck up the ramp to get a load of tree stumps and debris. He noticed an oil leak at one of the wheels and decided to drive the haul truck down the ramp to park it for repairs. As Bethard was traveling down the ramp, the parking brake locked up and the haul truck would not move. Jose A. Gonzalez Sr. was called to help remove the truck from the ramp. Due to a series of events, Jose A. Gonzalez Sr. was unable to maintain control of the haul truck as it descended the steep ramp. The haul truck was freewheeling with no transmission retarder braking and he had little time, due to the steep grade, to respond.

The accident occurred because management failed to ensure that the braking systems on the haul truck were maintained in a functional condition, causing the haul truck to stop on the ramp. Management also failed to ensure that the haul truck could be safely towed for repairs. The victim failed to maintain control of the truck he was operating and failed to wear the provided seat belt, contributing to the severity of his injuries.

GENERAL INFORMATION

Stevens Creek Quarry, a surface operation owned and operated by Stevens Creek Quarry Inc., is located near Cupertino, Santa Clara County, California. The principal operating official is Richard Voss, President. The mine operates one, eight hour production shift and one eight hour maintenance shift per day, five days per week. Total employment is 26 persons.

Overburden and rock are ripped and pushed by excavators and dozers, loaded into articulated off road haul trucks, and processed through a jaw crusher. The crushed material is screened, washed, and stockpiled. The finished product is sold as construction aggregate.

The Mine Safety and Health Administration (MSHA) completed the last regular inspection at this operation on May 29, 2013.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, Jose A. Gonzalez Sr., (victim) arrived at work at 6:00 a.m., his usual arrival time. He went to inspect and start the equipment to be operated that day and then continued with his normal duties of repairing equipment.

At approximately 1:00 p.m., Jose Gonzalez Jr. (the victim's son), Equipment Manager, was approached by Ricky Wahring, Equipment Operator. Wahring told him a haul truck was stuck on a hill and Jaime Bethard, Truck Driver, had been trying to contact him for assistance. Jose Gonzalez Jr. went to the tractor shop where Jose A. Gonzalez Sr. was having lunch and spoke with him about the truck. The two men got into a pickup truck and headed to the haul truck. They attempted to drive up a temporary ramp where the haul truck was located, but the 33% grade was too steep. Jose Gonzalez Jr. parked the pickup truck at the bottom of the ramp while Jose A. Gonzalez Sr. walked up the ramp to the haul truck to talk to Bethard.

Bethard explained that Jason Langell, Excavator Operator, called and asked him to drive up the hill and haul a load of tree stumps and debris out of the area. Bethard said he then dumped a load of rock at the quarry landing and backed the haul truck up the ramp to the landing at the top to be loaded with the tree stumps and debris. Bethard had engaged the load and dump brake, received the load, and set the parking brake so he could get out of the haul truck and talk to Langell. When Bethard exited the haul truck, he noticed a leak under the left front wheel.

Bethard decided to move the haul truck to safer ground. He got back in and released both brakes, put the haul truck in gear, and rolled forward with the retarder engaged. Bethard noticed that as soon as the haul truck passed the crest of the slope, the brake warning came on and the brakes locked up. He tried to get the brakes to release but was unsuccessful. Bethard said he reengaged the brakes, turned off the truck, and called for help on the radio.

When Jose A. Gonzalez Sr. finished talking to Bethard, he looked at the leak and then got into the haul truck. The haul truck's audible seat belt warning was going off, so he buckled the seat belt behind him to silence it. Bethard stated he was standing in the haul truck's doorway as Jose A. Gonzalez Sr. attempted to get the parking brake off with the key on. Bethard suggested adding brake fluid or to try using the excavator and dozer to move the haul truck down the grade but Jose A. Gonzalez Sr. started the engine.

At 1:14 p.m., Jose A. Gonzalez Sr. used a cell phone to call Jose Gonzalez Jr. telling him to move the pickup truck out of the way. Bethard got down from the haul truck as Jose A. Gonzales Sr. started raising the bed to dump the load. Bethard had retrieved his lunch pail and was walking away when he heard a loud clang. He turned around and saw the haul truck going down the hill with the bed in the raised position and picking up speed.

The haul truck appeared to freewheel down the hill, crossed a short flat spot at the bottom of the hill, and caught the berm with the left front wheel. It came down on the other side

of the berm where the victim was ejected out the right side window as the bed of the haul truck flipped on its side.

Jose Gonzalez Jr. had just finished chocking the pickup truck and ran to help the victim. Bethard ran to the haul truck and used a radio to call for help. Langell also ran down the ramp to help. The miners performed Cardiopulmonary Resuscitation (CPR) until Emergency Medical Services relieved them.

The victim was transported to Stanford Hospital where he was pronounced dead at 2:24 p.m. The cause of death was attributed to blunt force trauma.

INVESTIGATION OF THE ACCIDENT

On the day of the accident, MSHA was notified at 2:29 p.m. by a telephone call from Richard Voss, President, to the National Call Center. The National Call Center then notified Patricia Borer, Western District Staff Assistant, and an investigation was started the same day. MSHA issued an order under the provisions of 103(j) of the Mine Act to ensure the safety of the miners. This order was later modified to 103(k) of the Mine Act when the first Authorized Representative arrived at the mine. A non-contributory Part 50 citation was issued for late reporting.

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.

DISCUSSION

Location of the Accident

The accident occurred on a temporary ramp leading up to brushing and stripping activities for quarry expansion. This area was located above what was known as the quarry landing or the main working bench.

The haul truck started at the top of a 33% grade that extended for 280 linear feet with 94 feet of elevation change. The haul truck then crossed a 1% grade for 153 feet, struck a 7 foot, 7 inch high berm, and came to rest with its front end against another berm 79 feet past the first berm it struck.

Weather

The weather on the day of the accident was clear with a temperature of approximately 90 degrees Fahrenheit. Weather was not considered a contributing factor in the accident.

Equipment Involved in the Accident

The haul truck involved in the accident was a 2005 Volvo A35D six wheel articulated haul truck. It had one drive axle on the tractor (tractor axle) and two drive axles on the trailer. The haul truck was capable of several operating modes, including four wheel drive, six wheel drive, and full six wheel drive. Product information indicated the haul truck had an empty weight of approximately 62,390 pounds and was rated for a maximum payload of 71,649 pounds.

The haul truck was equipped with a Volvo D12C diesel engine and an electronically controlled automatic transmission with six forward speeds, two reverse speeds, and a neutral position. It had a transmission selector control lever on the console to the right of the operator's seat with control positions of D, 3, 2 and 1 for the forward direction. The haul truck also had a selectable low and high speed range, providing a total of 12 forward speeds and 4 reverse speeds.

General condition of the haul truck

The articulated haul truck came to rest with the tractor still upright on its two tires, the trailer (load unit) overturned onto its left side and with the hoist cylinders of the bed extended.

The left side tire of the tractor was deflated, portions of the front cab glass were cracked, the right side cab glass was broken out, the hoist lever control was damaged (jammed in the hold position) and portions of the self-lifting tailgate were torn from the truck bed. Otherwise, the haul truck generally appeared to sustain no significant damage during the accident.

All of the hydraulic lines for the service brake, steering and hoist systems, and the air lines for the parking brake system were visibly intact. All of the service brake system's axle and wheel end components were visibly intact except for a brake pad that had partially shifted out of the brake caliper's brake pad guides and a hydraulic leak from the brake end of the left side tractor wheel. The hydraulic leak was the reason the driver of the haul truck needed to shut it down and call the mechanic for assistance.

After the trailer portion of the haul truck was uprighted, the left front tractor wheel assembly was repaired, and the truck towed to another location for further inspection. The fluid level for the hydraulic tank was below the minimum mark with the engine off and the bed down (i.e., hoist cylinders retracted) but all of the other fluid levels were determined to be within specifications. The haul truck was eventually started and all operational checks were performed using its engine power.

Operator station

The haul truck was equipped with a seat belt that was found buckled after the accident. The victim had buckled the seat belt behind him to eliminate the seat belt warning while trouble shooting a brake warning on the haul truck. He did not refasten the seat belt around him before operating the haul truck. The seat belt was not damaged and the buckle functioned when tested. The haul truck was equipped with a Roll-Over Protective Structure (ROPS).

Haul truck differential locking system design and operating status

The haul truck had a series of differentials and locking clutches to provide operating modes of up to full six wheel drive capability. A longitudinal differential in the drop box provided four wheel drive (i.e., driven by both the tractor axle and the front bogie axle) and a dog-clutch assembly between the front and rear bogie axles provided six wheel drive (i.e., driven by the tractor axle, the front bogie axle and the rear bogie axle). Each of the three axles normally operated in an open differential type mode but had transverse (cross axle) locking differentials which could lock each side of the respective axle together. In full six wheel drive, all six wheels rotated at the same speed.

Two finger operated rocker type switches on the right side console and a foot button switch on the floor of the cab provided several different operating combinations. One finger operated switch provided four or six wheel drive while the second finger operated switch allowed independent control of the tractor's cross axle locking feature regardless of whether the haul truck was in four or six wheel drive. The foot button switch allowed the driver to operate in full six wheel drive as needed, overriding the operating modes of the two rocker switches.

Bethard indicated that he had the truck in six wheel drive (using the finger operated rocker switch in the on position) while operating the truck prior to it becoming disabled on the grade and before shutting the truck down. In addition, the finger operated switch was determined to be in the "on" position after the accident. This indicated the truck was in six wheel drive mode without the cross axle locking differentials engaged while traveling down the ramp before the accident occurred. The significance of this indicated that with the haul truck running, braking produced at any wheel end from the service brakes or on the driveline by the parking brake would be distributed to all six wheels and not isolated to any specific axle.

Parking brake condition and testing

The finger operated rocker type parking brake switch was found in the released position after the accident. The locking tab feature of the parking brake switch was intact and functioned when tested.

The parking brake indicator light in the dashboard panel was inoperative during initial portions of the field tests. It did not illuminate during the dashboard panel self-test

during start-up although all other indicator lights on the dashboard panel were observed to function during this mode. The light did not illuminate when the parking brake was applied with the haul truck operating. The indicator light functioned after the bulb was replaced. The bulb glass was intact but the filament appeared to have been burnt and separated.

The parking brake disc had black bands of discoloration on its contact surfaces and around the entire circumference of the disc. The lining segments on the parking brake pads had visible cracks. This condition was indicative of the parking brake having been dynamically applied during the operation of the haul truck and the linings experiencing thermal cycling. Both of the parking brake pad lining thicknesses were measured to be approximately 15 millimeters. The parking brake rotor (disc) thickness was measured to be 25.5 millimeters. These measurements were above the manufacturer's minimum brake pad lining and minimum brake rotor thickness specifications of 7 millimeters and 22 millimeters, respectively.

Field tests conducted on the haul truck indicated the parking brake (in an ambient temperature condition) was capable of holding the haul truck stationary on the grade where the accident occurred with the haul truck at the gross vehicle weight rating.

Service brake system condition and testing

Investigators determined that the outer brake pad lining for the left side tractor brake was worn down to metal and the brake pad had partially shifted out of the brake caliper's brake pad guides. This allowed one of the three brake pistons of the outboard side of the caliper to extend too far within its bore and develop a hydraulic leak at the piston seal. This was the source of the brake system hydraulic leak that led to the haul truck having operational issues resulting in the driver shutting the haul truck down on the grade and calling for assistance.

The hydraulic fluid level for the hydraulic tank was observed after the accident to be below the minimum mark with the engine off and the bed down. Field tests included further reducing the fluid level in the tank to simulate fully extended hoist cylinders then putting the haul truck on the toe of a test ramp having a grade similar to that where Jose A. Gonzalez Sr. was dumping the load prior to losing control of the haul truck. While operating the haul truck with the bed down in the simulated bed up position and low hydraulic fluid conditions, no cavitation of the hydraulic pumps occurred.

Dump body up speed limiting feature

When Jose A. Gonzalez Sr. had the dump body (truck bed) in the raised position, the engine controller would not accelerate when the accelerator foot pedal was depressed at ground speeds above 5 MPH, keeping the engine speed at low idle. The engine speed would increase above low idle at ground speeds above 5 MPH only if the transmission was engaged and the engine was being driven through the drive-train.

<u>Last confirmed truck status and operational impact</u>

Based on interviews with Bethard stating his observations immediately before the haul truck went out of control and the reported feedback of Jose A. Gonzalez Sr. to him before the accident occurred, investigators determined that the victim was holding the haul truck on the grade using the parking brake with the service brake pedal released. Investigators concluded that the victim then placed the transmission selector into a forward drive position and proceeded to dump the load. During interviews, Bethard stated the victim wanted to drive the haul truck to the bottom of the ramp.

Under these conditions and if the parking brake was then released by Jose A. Gonzalez Sr. using the parking brake switch, the haul truck would have immediately begun to roll downhill with the transmission in neutral until the transmission controller identified that operating conditions were appropriate to allow the transmission to engage into a forward gear. If the transmission controller did not allow engagement, the transmission itself would continue to remain in neutral with the hydraulic transmission retarder being ineffective even if the retarder pedal was being fully applied. With the transmission in neutral and the body up speed limiting feature activated, the engine controller would ignore any accelerator foot pedal commands once the haul truck obtained a ground speed above 5 MPH and then it would keep the engine at low idle.

Once the transmission was allowed to engage, there would be an additional lag time before the retarder could then provide an effective retarding force even if the retarder pedal was being fully applied due to any time that is needed to flood the chamber for the hydraulic retarder. The engine controller would still ignore the accelerator foot pedal commands due to the body up speed limiting feature once the haul truck obtained a ground speed above 5 MPH, but engine RPM at that time would be ground driven by the drive-train due to the motion of the truck. In addition, the transmission would automatically upshift as needed to prevent engine and transmission over-speed damage until reaching top gear, i.e. 6th gear.

Summary of condition of brakes

The parking brake (in an ambient temperature condition) was capable of holding the empty haul truck on the grade where the accident occurred.

The emergency brake features of the parking brake system functioned in that the parking brake automatically applied when both service brake circuits experienced low service brake accumulator pressures (low servo brake pressures) and the parking brake could be applied by the equipment operator with the transmission in gear and the haul truck moving.

The finger operated rocker type parking brake switch was found in the released position after the accident and during interviews, Bethard reported that the parking brake was still in the released condition when he switched off the electrical master disconnect shortly after the accident.

The parking brake indicator light in the dashboard panel was inoperative. The bulb glass was intact but the filament appeared to have been burnt and separated. The parking brake indicator light functioned after the bulb was replaced.

The service brake system had defects which caused low service brake accumulator pressures (low servo brake pressures) and adversely affected the service brake performance. These defects caused the electronic control system to provide a service brake warning (which included a service brake warning light on the control information display in the left side dashboard panel area, a red central warning light in the right side dashboard panel area, and an audible alarm within the cab) whenever the service brake foot pedal was fully applied.

These defects also caused the parking brake to automatically apply in most cases when the service brake foot pedal was initially fully applied. The only way in which the victim could have alleviated the service brake warning by the electronic control system prior to losing control of the haul truck and minimize the possibility of an automatic parking brake application before allowing the movement of the haul truck was by not applying the service brake foot pedal.

Electronically stored event data confirmed the haul truck experienced several low service brake pressure events in the time preceding the accident. However, it was determined that even in this compromised condition, the rear service brakes were capable of holding the empty haul truck on the accident grade as long as the engine remained running.

Control sequencing

Bethard and the victim both reported unexpected machine responses while operating the haul truck on the grade prior to the accident. Tests indicated this was due to them both using abnormal transmission selector sequencing (i.e., moving the transmission selector lever from neutral to a gear position with the parking brake switch in the applied position then applying the engine accelerator pedal).

Information provided by Bethard during interviews indicated that the last known status the victim had with the haul truck was that the transmission selector lever had been placed in a forward gear position with the parking brake applied prior to raising the bed on the grade to dump the load from the bed. Due to the sequencing used by the victim, the electronic control system on the haul truck would have kept the transmission itself in neutral until after the parking brake switch was released and operational conditions allowed the transmission to engage. Field tests identified that with the operational conditions caused by the service brake defects, it was highly likely that the only way the parking brake could have been kept from automatically applying was if the service brake pedal was not used by the victim immediately before releasing the parking brake or after the haul truck began to move downgrade.

Due to the operational conditions caused by the service brake defects, it would have been difficult for the victim to sequence the controls to result in the transmission itself being

actually engaged in a forward gear without the parking brake applied prior to allowing the haul truck to move downgrade.

Retarder capacities

An analysis of the maximum combined Volvo Engine Brake (VEB) and transmission retarder capacity indicated the speed in which the haul truck would have exceeded the combined VEB and transmission retarder capabilities was approximately 12.6 MPH and could have been achieved in as little as 2½ seconds.

Theoretically, any situation encountered by the victim in which the haul truck operated in neutral or free-wheeled for over 2½ seconds, could allow operating conditions that overran the combined VEB and transmission retarder capabilities.

Training and Experience

Jose A. Gonzalez Sr. had 30 years of experience as a mechanic, with 15 years, 16 weeks at this mine. A representative of MSHA's Educational Field Services staff conducted an in-depth review of the mine operator's training records. Investigators reviewed the training records for Jose A. Gonzalez Sr. and found his training to be up-to-date and in compliance with MSHA requirements.

ROOT CAUSE ANALYSIS

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

Root Cause: Management failed to ensure that routine maintenance was performed on the braking systems on the haul truck.

<u>Corrective Action</u>: Management established policies and procedures to ensure that maintenance is performed on haul trucks to keep the equipment in functional condition.

Root Cause: The victim did not maintain control of the haul truck he was operating.

<u>Corrective Action:</u> Management developed procedures to be followed when a haul truck signals a brake warning to the operator of the haul truck. All supervisors, mobile equipment operators, and mechanics have been trained regarding what procedures to follow when a brake warning occurs on a haul truck.

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

<u>Corrective Action:</u> All truck drivers received additional training regarding the required use of seat belts when operating a haul truck. Management will monitor truck drivers to ensure seat belts are worn.

CONCLUSION

The accident occurred because management failed to ensure that the braking systems on the haul truck were maintained in a functional condition, causing the haul truck to stop on the ramp. Management also failed to ensure that the haul truck could be safely towed for repairs. The victim failed to maintain control of the truck he was operating and failed to wear the provided seat belt, contributing to the severity of his injuries.

ENFORCEMENT ACTIONS

Issued to Stevens Creek Quarry Inc.

Order No. 8696388 – issued 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 06/13/2013 at approximately 13:34 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 Upper Quarry area and Volvo A35 Haul Truck until MSHA has determined that it is safe to resume normal mining operations in this area. This order was initially issued orally to the mine operator at 15:11 hours and has now been reduced to writing. This order was terminated after conditions that contributed to the accident no longer existed.

Citation No. 8607950 – issued for a violation of 30 CFR 56.14101(a)(3):

A fatal accident occurred at this mine on June 13, 2013, when a mechanic was ejected from the cab of a haul truck he was operating. The haul truck went out of control while traveling down a steep grade. The brakes were not maintained in a functional condition. The condition of the brakes has been allowed to deteriorate until a failure occurred in the left front wheel and the brakes on three other wheels were dangerously worn. The haul truck operated on steep grades. The mine operator engaged in aggravated conduct constituting more than ordinary negligence by not ensuring that the brakes on the haul truck were maintained in functional condition. This is an unwarrantable failure to comply with a mandatory standard.

Citation No. 8607951 – issued for a violation of 30 CFR 56.14131(a):

A fatal accident occurred at this mine on June 13, 2013, when a mechanic was ejected from the cab of a haul truck he was operating. The haul truck went out of control while traveling down a steep grade. The victim had buckled the seat belt behind him to silence the seat belt alarm while

trouble shooting a brake alarm on the haul truck. He did not refasten the seat belt around him before operating the haul truck.

Citation No. 8607998 – issued for a violation of 30 CFR 56.9101:

A fatal accident occurred at this mine on 06-13-2013, when a mechanic was ejected from the cab of a haul truck he was operating. The mechanic failed to maintain control of the haul truck while traveling down a steep grade.

Approved:

Wyatt Andrews

APPENDICES

APPENDIX A: Persons Participating in the Investigation

APPENDIX B: Victim Information

APPENDIX A

Persons Participating in the Investigation

Stevens Creek Quarry Inc.

Richard Voss President

Daniel Boyle CFO

Jason Voss Production Manager

Michael Gillen Safety Manager

Volvo

Justin Martin Service Manager

Mine Safety and Health Administration

Chad Hilde Mine Safety and Health Inspector

Fred T. Marshall Mechanical Engineer

Norman Zeman Supervisory Mine Safety & Health Specialist

Jason Jeno Mine Safety & Health Inspector

APPENDIX B

Victim Information

Event Number: 6 5 9 2 4 4 2									Mine Safety and Health Administration							
Victim Informati	ion:	1	812			CC-										
1. Name of Injured/III Employee:			2. Sex	3. Metim's	Age 4. Degree of hjury:											
Jose A. Gonzalez			M 49		01 Fat		ta/									
5. Date(MM/DD/	YY) and T	ime(24 Hr.)	Of Death:	7A 14969			6. Dat	e and Tim	e Started:							
a. Date: 06/13/2013 b.Time: 14:24							a. Date: 06/13/2013 b. Time: 6:00									
7. Regular Job Title: 8. W						3. Work Activity when Injured:					9. Was this work activity part of regular job?					
104 Mechanic					055 Operating a haul truck							Yes	X No			
10. Experience a. This	Years	Weeks	Days	b. Regular	Years	Weeks	Days	c: This	Years	Weeks	Days	d. Total	Years	Weeks	Days	
Work Activity:	30	0	0	Job Title:	15	16	1	Mine:	15	16	1	Mining:	15	16	1	
11. What Directly 002 Ex		njury or I lne <i>cab of truck</i>							e of Injury: <i>Multiple bi</i>	or Illness: I <i>unt for</i> ce <i>in</i>	juries					
13. Training Defoiencies: Hazard: New/Newly-Employed Experienced Miner:									Annual:	ĹĬ	Task:	11				
14. Company of I	2000	nt: (If differe	nt from proc	luction opera	ntor)	3 27			ŀ	ndepen dent	Contractor	D: (ifapplic	able)			
15. On-site Erner Not Applica	Part of the same	dical Treatm First	165.1	c	PR: X	вит:	[x]	Medi	cal Profes	sional:	None:	1.1				
16. Part 50 Docu	ment Cont	rol Number:	(form 7000	-1)	\$1		17. Unio	n Affiliatio	n of Victim	1: 2678	Opera	itors Union				