MAI-2010-11

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

REPORT OF INVESTIGATION

Underground Metal Mine
(Silver)

Fatal Fall of Ground Accident
June 18, 2010

United Mine Services
Contractor I.D. No. U532

at

Galena Mine
U.S. Silver – Idaho, Inc.
Wallace, Shoshone County, Idaho
Mine I.D. No. 10-00082

Investigators

Rodney D. Gust
Mine Safety and Health Specialist

Ronald Eastwood
Mine Safety and Health Inspector

James G. Vadnal
Mining Engineer

Melvin K. Palmer
Mine Safety and Health Specialist

Originating Office
Mine Safety and Health Administration
Western District
2060 Peabody Road, Suite 610
Vacaville, California 95687
Wyatt Andrews, Acting District Manager

3400-287 Raise

OVERVIEW

Timothy A. Bush, contract miner, age 29, died on June 18, 2010. He was struck by falling material while working in a development raise. Bush and a coworker were bolting the ground when he attempted to manually scale loose material from the back. The other miner was not injured.

The accident occurred because management, policies, procedures, and controls were inadequate and did not protect persons working in the raise. Procedures were not implemented to control the ground when conditions changed exposing persons to adverse ground conditions. Additionally, the scaling bar that was provided did not ensure that persons could scale the ground from a location that did not expose them from falling material.

GENERAL INFORMATION

Galena Mine, an underground silver-copper mine, operated by U.S. Silver – Idaho, Inc. is located near Wallace, Shoshone County, Idaho. The principal operating official is Andrew Gaudielle, mine manager. The mine normally operates two 8-hour shifts per day, 5 days a week. Total employment is 215 persons.

United Mine Services, located in Pinehurst, Shoshone County, Idaho, was contracted by U.S. Silver – Idaho, Inc., to operate a portion of the mine. The principal operating official was Greg Stewart, president. Contractor employment was 30 persons.

Silver-copper ore is drilled, blasted, and transported by rail to a shaft where it is hoisted to the surface. The ore is then processed by a milling operation. Finished products were sold to commercial industries.

The last regular inspection at this operation was completed on January 27, 2010.

DESCRIPTION OF THE ACCIDENT

On June 18, 2010, Timothy A. Bush, (victim), reported to work at 5:30 a.m. for his normal shift which began at 6:00 a.m. Matt Karst, supervisor, assigned Bush and Jeremy Figueroa, contract miner, their normal underground work duties that consisted of installing ground support in the 3400-287 Raise. The miner that usually worked with Figueroa did not work this shift. Bush was instructed to work in the raise because he had experience working in raises.

On the day before the accident, Figueroa and another contract miner started installing ground support in the raise. Bolting was difficult because the back/face they were supporting had fallen about 6 feet higher than normal. That portion of the raise was blasted on June 11, 2010, making the back about 16 feet high. They installed about twenty, 4-foot rock bolts during that shift.

About 7:00 a.m., Bush and Figueroa continued the task of installing conventional rock bolts in the back. Figueroa was operating a jack leg drill while Bush assisted. They stopped installing ground support to scale loose material.

About 8:09 a.m., Bush was using a manual scaling bar to scale loose material from the back and hanging wall when loose material fell and struck him. Figueroa immediately notified Mitch Brower Sr., nipper, who called to the surface for assistance. Rescue efforts began without delay.

Bush was taken down the raise to the 3400 level and Cardiopulmonary Resuscitation (CPR) was administered because he was nonresponsive. Bush was transported out of the mine and then to a local hospital where he was pronounced dead by the Shoshone County Coroner. The cause of death was attributed to blunt force trauma.

INVESTIGATION OF THE ACCIDENT

Ronald Eastwood, mine safety and health inspector, was notified of the accident at 8:15 a.m. on June 18, 2010, by Mark Bren, mine superintendent. Eastwood was conducting a regular inspection at the mine that day. An accident investigation began the same day. An order was issued under the provisions of section 103(k) of the Mine Act to ensure the safety of the miners.

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

DISCUSSION

Location of the Accident

The accident occurred in the 3400-287 Raise. Each working level was designated by the distance from that location to the surface, i.e., the 3400 level was 3,400 feet from the surface. From each shaft station, drifts (tunnels) were mined back to the raises and stopes. The raise where the accident occurred had been mined vertically about 175 feet toward the 3400 level, leaving only about 25 feet of material to mine to the 3200 level.

Prior to the accident, about 1/3 of the back/face area had been bolted. About 2/3 of the back/face area and all of the ribs remained to be bolted.

Mining Methods

The majority of the ore produced at the mine is mined by the "conventional overhand" cut and fill method. In conventional overhand stoping, the vein is accessed by crosscuts developed from drifts that are driven along the vein structure. Development of the vein is accomplished by driving near vertical, timbered three-compartment Raises along the vein from one level to the next level above.

A typical "overhand" stope extends 100 feet or more horizontally along the vein on either side of a raise. In a cut and fill stope, a cut of ore, from 6 to 12 feet in height, is mined over the length of the stope. After all the broken ore is removed from the stope, the void is filled with a slurry of mill tailings by a process referred to as sand filling.

After the sand filling is completed, another cut can be mined from the stope using the sand fill in the previous cut as a floor.

Geology

The mine is located in the Coeur d'Alene Mining District that occurs within a shear zone characterized by steeply dipping faults. The ore bearing veins are found along four major fracture systems and major faults. Veins cut through quartzites and siltites of the Revett formation for over 4,200 vertical feet with an average strike length of 1,000 feet. The veins range from 1 foot to 15 feet wide but typically average about 4 feet wide. Silver ore veins consist of massive siderite with pods of quartz and chalcopyrite and scattered blebs and stringers of tetrahedrite.

The 3400-287 Raise is being developed in the 117 Vein, bounded by the South Argentine fault on the hanging wall side. Both the hanging wall and the foot wall are composed of siltite. The Raise is steeply inclined. Investigators determined an inclination of 85 degrees several sets below the accident site.

As the Raise progressed upward, a second fault appeared in the foot wall that angled toward the South Argentine fault. When the second fault appeared, the 117 Vein "rolled over" and became more steeply inclined to 88 degrees. As this occurred, the vein in the 3400-287 Raise thinned from approximately 7.5 feet to approximately 4 feet and was bounded by the South Argentine fault and the foot wall fault. The material that fell when the accident occurred originated between these two faults and was composed of mostly silver ore.

Rock Bursts and Micro Seismic Monitoring

As a result of a past history of rock bursts at the mine, an extensive system of micro seismic detection devices were installed. The mine wide network consists of 48 geophones located throughout the mine. Communication cables are connected to computing and recording equipment located in the mine office. These devices are continuously monitored. The monitoring system did not indicate any micro seismic activity before or after the accident.

The hanging wall and the foot wall, at the accident site, were composed of siltites that was considered too "soft" to create rock burst conditions.

Ground Support

The ground support plan used at the mine was developed by mine management and an engineering consulting firm. Ground support used in the 3400-287 Raise consisted of rock fixtures and timbers.

Ground support was provided with rock fixtures on an as-needed basis. The rock fixtures used in the 3400-287 Raise included conventional (mechanical) bolts and Friction-Loc Stabilizers, commonly referred to as "split sets". The rock bolts used in the

back were 48 inches long, 5/8-inch diameter, grade 75 conventional bolts with expansion shells with 6-inch by 6-inch steel bearing plates. Four foot long split sets are used to support the crowns and walls of the raise. Twelve inch wide steel mats are used in conjunction with split sets installed with 6-inch by 6-inch steel bearing plates to supplement ground control in both the hanging wall and foot wall of the raise.

Additionally, conventional bolts are installed with 12-inch by 16-inch by $^{7}/_{8}$ inch thick, plywood boards and 6-inch by 6-inch steel bearing plates placed on 2-foot to 3-foot centers on an as needed basis.

After the near vertical Raise is secured by rock fixtures, timber supports are installed. Each 4-cap timber set consists of eight – 62 inch posts, with 4 caps, six girts, heading and lacing. This method provides for a three-compartment raise. The middle compartment was the manway and timber slide and the compartments to the west and east were used for muck.

Scaling Tools

Two manual scaling bars were available in the 3400-287 Raise. Both were aluminum round stock bars with a chisel sounding and prying bit on one end. A six foot bar was found under the victim. The other bar, 10 foot long, was found leaning against the foot wall on the west side of the stope.

Training and Experience

Timothy R. Bush had six years of mining experience. He had twenty two months experience driving raises at this mine and had been trained in accordance with 30 CFR Part 48.

Jeremy Figueroa had 12 years, 34 weeks of mining experience. He had 34 weeks of experience at this mine and had been trained in accordance with 30 CFR Part 48.

ROOT CAUSE ANALYSIS

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

Root Cause: Management policies, procedures, and controls failed to ensure that the scaling bar used by the victim protected him from falling material.

Corrective Action: Management established policies, procedures, and controls to ensure that the proper length and design of scaling tools being used protected persons from falling material. Miners received additional training regarding the use of the proper length and design of scaling tools.

Root Cause: Management policies, procedures, and controls failed to ensure that persons scaled loose ground from a safe location.

Corrective Action: Management established policies, procedures, and controls to ensure that persons scaling loose ground perform the task from a safe location. The miners received additional training regarding proper manual scaling methods.

Root Cause: Management policies, procedures, and controls failed to ensure that safe ground conditions were established and maintained where persons work or travel.

Corrective Action: Management has established policies, procedures, and controls to ensure that safe ground conditions are established and maintained. When ground conditions are adverse, changes in the ground control plan are required to ensure the installation of adequate ground support. Experienced persons received additional training to evaluate, support, and maintain adverse ground conditions.

CONCLUSION

The accident occurred because management, policies, procedures, and controls were inadequate and did not protect persons working in the raise. Procedures were not implemented to control the ground when conditions changed exposing persons to adverse ground conditions. Additionally, the scaling bar that was provided did not ensure that persons could scale the ground from a location that did not expose them from falling material.

ENFORCEMENT ACTIONS

Issued to U.S. Silver – Idaho, Inc.

Order No. 8563580 was issued on June 18, 2010, under the provisions of Section 103(k) of the Mine Act:

> A fatal accident occurred at this operation on June 18, 2010, at approximately 8:09 a.m. when a roof fall occurred in the 3400-287 Raise. As rescue and recovery work is necessary, this order is being issued, under Section 103(k) 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 3400-287 Raise 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 9:00 a.m. and has now been reduced to writing. The mine operator shall obtain prior approval from an Authorized Representative of the Secretary for all actions to recover and/or restore operations in the affected area.

The order was terminated on September 8, 2010. Conditions that contributed to the accident no longer exist.

Citation No. 6437660 was issued on September 1, 2010, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 57.3360:

> A fatal accident occurred on June 18, 2010, when a contract miner was struck by falling material while working in the 3400-287 Raise. The falling material measured 3 ½ feet by 2 ½ feet by 1 ½ feet, and fell from over 16 feet from the back. Ground support had not been designed or installed to control the ground in this work area. The ground conditions changed in this location, when the last two rounds over broke an additional 4 feet or more. Rather than stopping work in the area, contract management and mine management were looking into alternative options. In the meantime, the victim and his partner were exposed to an excessively high back resulting from the changing ground conditions. Management engaged in aggravated conduct constituting more than ordinary negligence in that they were aware of the changing ground conditions and an excessively high back, yet they still allowed the contract miners to work in these inherent hazards. This violation is an unwarrantable failure to comply with a mandatory standard.

This citation was terminated on October 25, 2010. Management established policies, procedures, and controls to ensure that persons installing ground support are protected. When ground conditions are adverse, changes in the ground control plan are required to ensure the installation of adequate ground support. Experienced persons were further trained to evaluate, support, and maintain adverse ground conditions.

Issued to United Mine Services

Citation No. 6437657 was issued on September 1, 2010, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 57.3201:

> A fatal accident occurred at this operation on June 18, 2010, when a contract miner was struck by falling material while working in the 3400-287 Raise. Scaling was being performed from a location that exposed the miner to receiving fatal injuries from the fallen material which measured to be up to 3 ½ feet by 2 ½ feet by 1 ½ feet, which fell from over 16 feet from the back. It was obvious that the ground conditions had changed when the last two rounds were blasted, as each

round over broke by at least 4 feet. Management engaged in aggravated conduct constituting more than ordinary negligence in that they were aware of how the changing ground conditions resulted in an increasing back height, yet failed to ensure that miners were either provided with a safe location or other protection from the falling material when performing scaling. This violation is an unwarrantable failure to comply with a mandatory standard.

This citation was terminated on October 25, 2010. Management established policies, procedures, and controls to ensure that persons engaged in the scaling of loose ground perform the task from a safe location. The miners have received additional training regarding proper manual scaling methods.

Citation No. 6437658 was issued on September 1, 2010, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 57.3202:

A fatal accident occurred at this operation on June 18, 2010, when a contract miner was struck by falling material while working in the 3400-287 Raise. The fallen material measured to be up to 3 ½ feet by 2 ½ feet by 1 ½ feet, which fell from over 16 feet from the back. The scaling bars provided for performing manual scaling were not long enough to allow the safe removal of loose material. A six foot long scaling bar was found underneath the victim and the material that had fallen. Another scaling bar measuring 10 feet long was found leaning against the foot wall on the chute bulkhead. The back at the accident site was over 16 feet high, which was measured from the muck covered bulkhead over the manway compartment. Therefore, neither scaling bar was of sufficient length to allow the removal of loose material without exposing the miner performing the work to injury. It was obvious that the ground conditions had changed when the last two rounds were blasted, as each round over broke by at least 4 feet. Management engaged in aggravated conduct constituting more than ordinary negligence in that they were aware of how the changing ground conditions resulted in an increasing back height, yet failed to ensure that the bar provided was of a length and design to protect the victim from injury. This violation is an unwarrantable failure to comply with a mandatory standard.

This citation was terminated on October 25, 2010. Management established policies, procedures, and controls to ensure that the proper length and designed scaling tools are used to ensure persons performing the work are not exposed to falling material. Miners have received additional training on using the proper length and design of scaling tools.

Citation No. 6437659 was issued on September 1, 2010, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 57.3360:

A fatal accident occurred at this operation on June 18, 2010, when a contract miner was struck by falling material while working in the 3400-243 Raise. The falling material measured to be up to 3 ½ feet by 2 ½ feet by 1 ½ feet, which fell from over 16 feet from the back. Ground Support had not been designed or installed to control the ground in this work area. The ground conditions had obviously changed in this location, as the last two rounds over broke an additional 4 feet or more. Rather than stopping work in the area, contract management and mine management were looking into alternative options. In the meantime, the victim and his partner were continually exposed to an excessively high back resulting from the changing ground conditions. Management engaged in aggravated conduct constituting more than ordinary negligence in that they were aware of the changing ground conditions and an excessively high back, yet they still allowed the contract miners to work in these inherent hazards. This violation is an unwarrantable failure to comply with a mandatory standard.

This citation was terminated on October 25, 2010. Management established policies and procedures to ensure that ground support systems are designed and installed to control the ground in places where persons work or travel.

Approved By:

_____ _____

Wyatt Andrews Date
Acting District Manager

APPENDICES

APPENDIX A

Persons Participating in the Investigation

United Mine Services

Jeff Lambert	underground mining manager
Steve Ivie	underground mining manager

U.S. Silver – Idaho, Inc.

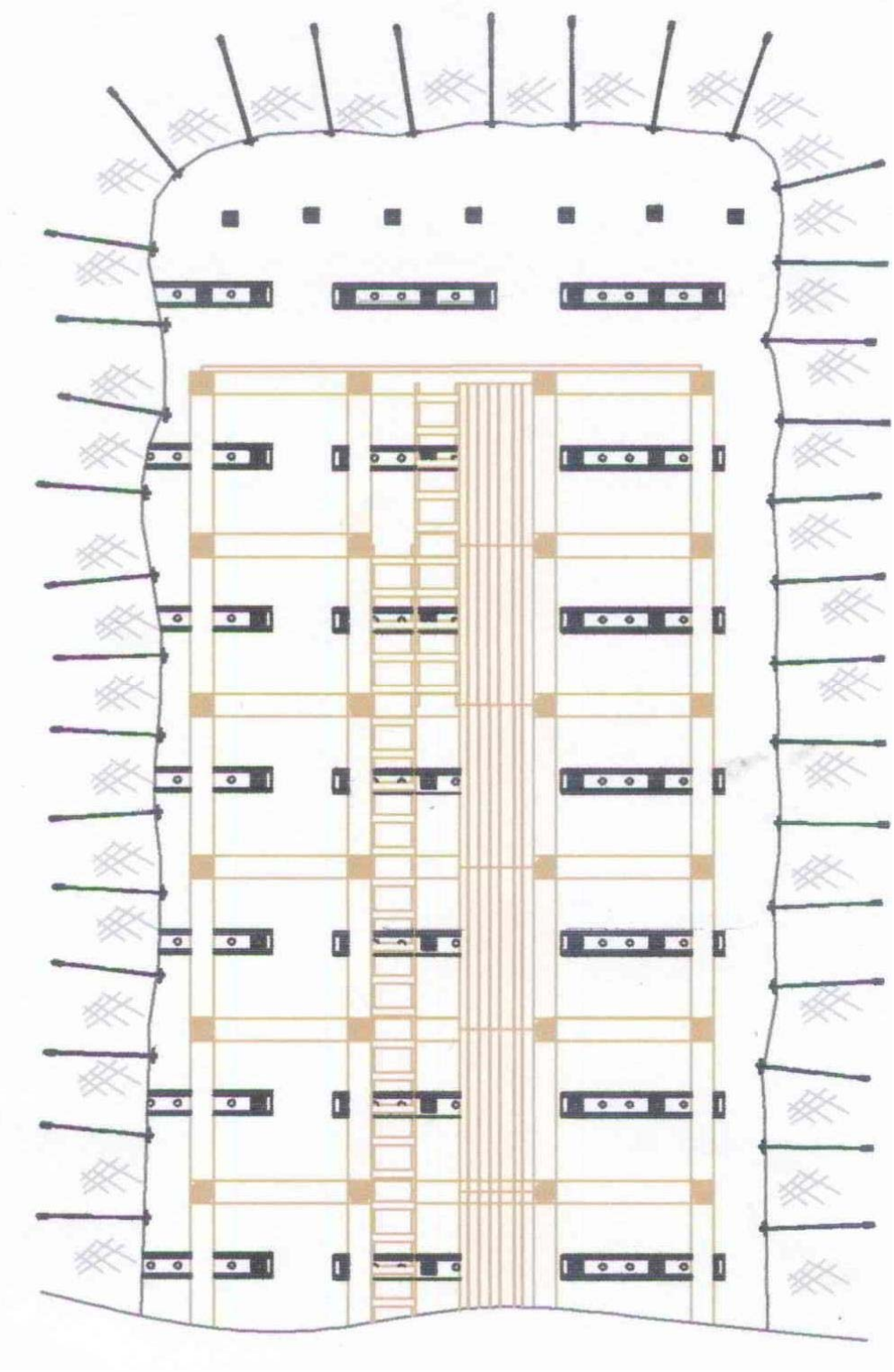
Andrew Gaudielle	mine manager
Mark Bren	mine superintendent
Harry Lenhard	senior geologist
Terry Jacobs	human resources & safety manager

Mine Safety and Health Administration

Ronald Eastwood	mine safety and health inspector
Rodney D. Gust	mine safety and health specialist
Melvin K. Palmer	mine safety and health specialist
James G. Vadnal	mining engineer

APPENDIX B

4 Cap Raise Diagram



APPENDIX C

Victim Data Sheet

Accident Investigation Data - Victim Information
Event Number: 1 1 5 4 5 5 4

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:
Timothy Bush	*M*	*29*	*01 Fatal*

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death:	6. Date and Time Started:
a. Date: 06/18/2010 b.Time: 11:00	*a. Date: 06/18/2010 b.Time: 6:00*

7. Regular Job Title:	8. Work Activity when Injured:	9. Was this work activity part of regular job?
059 Raise Miner	*098 Manual Scaling*	Yes X No

10. Experience	Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days
a. This Work Activity:	*1*	*0*	*0*	b. Regular Job Title:	*6*	*0*	*0*	c: This Mine:	*1*	*36*	*0*	d. Total Mining:	*6*	*0*	*0*

11. What Directly Inflicted Injury or Illness?	12. Nature of Injury or Illness:
090 Fall of Rock	*390 Blundt force trauma*

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

14. Company of Employment: (If different from production operator)
Unite Mine Services
Independent Contractor ID: (if applicable) *U532*

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

16. Part 50 Document Control Number: (form 7000-1)
17. Union Affiliation of Victim: *9999* *None (No Union Affiliation)*