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

REPORT OF INVESTIGATION

Underground Mine
(Lead and Zinc)

Fatal Fall of Ground Accident
January 25, 2007

J. S. Redpath Corp..
Contractor I.D. No. R83
at
Teck Cominco American Inc
Pend Oreille Mine
Metaline Falls, Pend Oreille County, Washington
Mine I.D. No. 45-00366

Investigators

Randy L. Cardwell
Supervisory Mine Safety and Health Inspector

David J. Small
Mine Safety and Health Inspector

William J. Gray
Mining Engineer

Sandin E. Phillipson
Geologist

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
Arthur L. Ellis, District Manager

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OVERVIEW

Phillip O. Markhart, underground miner, age 43, was fatally injured on January 25, 2007, while operating a roof bolter. Markhart was installing wire mesh when a large rock fell and struck him.

The accident occurred because management failed to design and maintain a ground support system in a manner that would control the ground where the bolter operators were performing their assigned tasks. A bolt sequence to ensure the safe handling and installation of the welded wire ground support panels was not in place at the time of the accident.


Victim's Position

GENERAL INFORMATION

Pend Oreille Mine, an underground lead and zinc ore operation, owned by Teck Cominco American Inc., was located in Metaline Falls, Pend Oreille County, Washington. The principal operating official was Mark J. Brown, general manager. The mine normally operated two 11-hour shifts per day, five days a week. Total employment was 181 persons.

J. S. Redpath Corp.., (Redpath) located in Sparks, Washoe County, Nevada, was contracted by the mine operator to develop a portion of the mine's drifts. The principal operating official was Christopher C. Hickey, general manager. A formal agreement specifying the scope of work was finalized in December 2006 and Redpath commenced activities at the Pend Oreille Mine the week of January 8, 2007. Redpath normally worked two 11-hour shifts, five days a week and employed 13 persons at the mine.

The rock was drilled, blasted, and moved by front-end loaders and trucks to an underground shaft hoist and then to an underground stockpile area. The material was transported to the surface by conveyor belts where it was processed by a milling operation. The finished products were shipped and sold to commercial industries.

The last regular inspection at this operation was completed on December 12, 2006.

DESCRIPTION OF ACCIDENT

On January 24, 2007, Phillip O. Markhart, (victim), and Monte Nelson, miner, started to work at 6:30 p.m., in the W83D4J heading (drift). The heading had been loaded and blasted at the end of day shift. After they loaded the shot rock out of the heading with a front-end loader, they brought a roof bolter to the heading to start the bolting cycle. The grade of the heading was too steep for the roof bolter to climb under its own power so a front-end loader was used to push it into position. Nelson and Markhart then began installing wire mesh and rock bolt supports.

At approximately 12:30 a.m., on January 25, 2007, Joel Clark, shift boss, entered the heading, talked with the miners, and examined the area. The roof bolter would not climb the heading again but had to be advanced to continue the bolting cycle. Clark operated the front-end loader to push the roof bolter forward so the bolting operation could continue and at approximately 12:45 a.m., he left the work area.

Clark had pushed the roof bolter forward to a location that placed a portion of the roof bolter's work platform beyond the last row of bolts previously installed (Appendix D). The miners then installed one panel of wire mesh on the left rib with two bolts. At approximately 1:00 a.m., as they continued to install wire mesh, a large rock fell from the roof, striking Markhart and pushing Nelson out of the way.

Nelson could not remove the rock from the victim so he went into the next drift and got Josh Eoff, driller, to help him. They removed the rock and Nelson called for emergency

assistance. Markhart was transported to the surface and then transferred to a local fire station where he was pronounced dead. The cause of death was attributed to blunt force trauma.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 2:15 a.m., on January 25, 2007, by a telephone call from Brad Davenport, senior safety coordinator, to Steve Cain, supervisory mine safety and health inspector. An investigation was started 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 management, the contractor, the employees, a miner's representative, the local fire department, and the county sheriff's office.

DISCUSSION

Location of the Accident

The accident occurred near the face in the Warren zone, the lowest ore body being developed in the mine. The face of W83D4J heading (drift) was approximately 65 feet from the last intersection.

The W83D4J heading was being developed by Redpath. They mined this heading beginning approximately 14 feet north of the 3-way intersection defined by the W83D4J and dog-legged W83D5 headings (Appendix B). The original W83D5 heading was narrowed down and split into the W83D5 drift, mined from the mouth to an extent of 65 feet toward the east-northeast and the W83D4J drift, mined approximately 45 feet due North.

As measured with the clinometer on a handheld transit, the floor grade along the original, northeast-trending portion of the W83D5 drift was 10-12 degrees (approximately 20 percent grade) into the 3-way intersection. The floor grade increased slightly to 13 degrees from the center of the 3-way intersection to a position approximately 12 feet into the W83D4J drift. This was the approximate position at which Redpath began mining. From this point, the floor grade increased to 18 degrees (33 percent grade) over a distance of approximately 20 feet, before returning to a more moderate grade toward the face.

Geological Conditions

The geology was characterized by thinly bedded dolomite that strikes northwest and dips 20 degrees toward the southwest, with beds inclined toward the mouth of the W83D4J drift. A prominent, two foot wide, fault zone was exposed in the face, angled from the top, right corner downward to the middle of the face where it intersected the floor. The

fault zone strikes approximately N 13 degrees E and dips approximately 67 degrees toward the northwest extending across the back to intersect the left rib about 15 feet from the drift mouth (Appendix C). The fault zone was characterized by sheared-out blocks of dolomite, with adjacent bedding planes exhibiting drag motion along the sheared zone. As exposed in the back, the hanging wall block was characterized by a series of closely spaced (2 inches) joints that paralleled the main fault zone.

Roof Bolter

The roof bolter involved in the accident was manufactured by MacLean Engineering and Marketing Co. of Ontario, Canada. The MacLean model MEM-928 had a rock drill with a scissor lift work platform.

The operator's tram compartment was equipped with a Roll-over Protective Structure (ROPS) and a Fall Protective Structure (FOPS) certified canopy. However, the roof bolter's elevated work platform, from where the rock bolts were installed, was not equipped with an operator's canopy or any auxiliary roof support jacks. This work platform was approximately 8-feet wide and 13-feet long featuring both a vertical adjustment of approximately 6 feet via a scissors lift linkage and a front-to-back sump capability of approximately 39 inches. The bolting machine was not equipped with a device to handle the 5 foot by 10 foot wire mesh panels. Loading of the wire mesh onto the top of the drill mast and positioning it prior to bolting, required handling by the miners positioned on the elevated work platform.

The bolter had a single, mast-feed style drill boom which inCorp.orated an indexing mechanism with one position for drilling and a second for bolt installation. This design eliminated the need for drill steel handling but still required manual loading of the roof bolt for each installation. Although the roof bolter was a single-boom design and the manufacturer advertised it as a one-man operation, reportedly a two man crew was always used by Redpath. The typical operation involved one operator manning the controls, either at the main valve bank or via a tethered remote unit and the second person acting as a helper handling the bolts and wire mesh panels.

MacLean Engineering literature technical specifications listed a maximum grade of 20 percent for the Model 900 series roof bolter. The floor grade where the roof bolter was positioned at the time of the accident exceeded 20 percent. A violation was issued for using the bolter beyond the manufacturer's designed capacity. This violation was not determined to have contributed to the accident.

Bolting Cycle

The written contract between Teck Cominco American Inc, and Redpath specified that primary ground support would consist of eight-foot Swellex bolts, on a 4 foot by 4 foot pattern with (6-gauge, 5-foot-wide by 10- foot-long) welded wire mesh.

Fall of Ground

A shallow cavity was exposed in the center of the main fault zone, recognized by freshly exposed joint surfaces that were not coated with dust, and also by poorly developed slickensides. The cavity was approximately 14 feet long, 2 feet wide, and one foot deep. It extended from the right corner of the face and followed the fault zone to the edge of the last panel of unbolted wire mesh. The dimensions of the fall cavity contained an estimated 23 cubic feet of dolomite, weighing approximately 3,800 pounds.

The bolter deck was littered with blocky pieces of dolomite ranging in size from 1 inch to 12 inches, in addition to the main piece of intact rock that covered the victim. The largest piece of intact rock on the bolter deck, which had been moved to free the victim, was approximately 5 feet long, 2 feet wide, and 10 inches thick at its maximum, although it tapered slightly to define a wedge-shaped cross section. The intact rock weighed about 1,350 pounds.

Drift width varied between 15 to 19 feet, with a height of 18 to 19 feet. The blasting pattern reportedly required the outside blast holes to be drilled at the intended rib line and roof line. Wire mesh bolted to the roof and ribs caught abundant pieces of broken, angular, rough-surfaced rock. Rock fragments ranged in size from 2-24 inches, and were defined by rough fracture surfaces indicative of blasting, rather than by smoother, more regular surfaces that would be indicative of naturally occurring geologic structures.

Training and Experience

Phillip O. Markhart had seven years of mining experience and one year of experience operating other roof bolters. He began working at this mine on January 24, 2007, and had not received training in accordance with 30 CFR, Part 48.

Monte L. Nelson had seven years of mining experience and one year of experience operating a MacLean roof bolter. He began working at this mine on November 29, 2006, and had received training 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 and controls were inadequate and did not ensure that newly hired experienced miners were trained before they were assigned to begin work duties. The victim had received site specific training but had not received training on the mine's roof control plan and was unfamiliar with the ground conditions at this mine.

Corrective Action: Management should develop and implement plans to train newly hired experienced miners before they are assigned to work.

Root Cause: Management policies and controls were inadequate and did not ensure that persons were protected from fall of ground hazards when they were installing wire mesh. The elevated work platform was not equipped with a canopy; the bolting machine was not equipped with a device to handle the wire mesh; roof support jacks were not provided; and a detailed bolt installation sequence was not being utilized to ensure miners were located under supported ground when installing ground support.

Corrective Action: Management should establish policies and controls to ensure that persons can safely install ground support. Management should monitor persons conducting the task of installing ground support to ensure that policies and controls are effective in protecting the miners.

CONCLUSION

The accident occurred because management failed to design and maintain a ground support system in a manner that would control the ground where the bolter operators were performing their assigned tasks. A bolt sequence to ensure the safe handling and installation of the welded wire ground support panels was not in place at the time of the accident. The failure to train the victim on the mine's roof control plan and to ensure he was familiar with the ground conditions at this mine and understood how to safely install ground support contributed to this accident.

ENFORCEMENT ACTION

Teck Cominco American Inc.

Order No. 6342331 was issued on January 25, 2007, under the provisions of Section 103 (k) of the Mine Act:

> A fatal accident occurred at this operation on January 25, 2007, when a miner was installing bolt and wire support in the W83D4J heading and was struck by falling material. This order is issued to assure the safety of persons at this operation and prohibits any work in the affected area until MSHA determines that it is safe to resume operations as determined by an authorized representative of the secretary of labor. The mine operator shall obtain approval from an authorized representative for all actions to recover and or restore operations in the affected area.

This order was terminated on January 29, 2007, after conditions that contributed to the accident no longer existed.

J.S. Redpath Corp..

Citation No. 6338476 was issued on March 20, 2007, under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 48.6(b):

A newly employed miner was fatally injured at this mine on January 25, 2007, when the unsupported ground above his work location fell and struck him. The victim and a coworker were installing rock bolts while positioned on the elevated work deck of the mobile roof bolter. The victim had received site specific training but had not received experienced miner training (Phillip Markhart) before he began work at the mine site. This was the first shift for the victim at this mine. He was not trained regarding the health and safety aspects related to the task of installing roof bolts at this mine. He was not provided training on the mine's roof control plan and therefore was unfamiliar with the ground conditions at this mine. The victim had been assigned to a production heading and was working with another roof bolter when the accident occurred.

This citation was terminated on March 20, 2007. Management has implemented procedures to train newly hired experienced miners before beginning any work.

Citation No. 6338477 was issued on March 20, 2007, under the provisions of Section 104(d) of the Mine Act for a violation of 30 CFR 57.3360:

A contract miner was fatally injured at this mine on January 25, 2007, when the unsupported ground above his work location fell and struck him. The victim and a coworker were installing rock bolts while positioned on the elevated work deck on the mobile roof bolter. Ground support had not been installed to control the ground at their work location. The supervisor had visited this work area earlier and had helped to position the mobile roof bolter at this location. Failure to ensure that the elevated work deck was positioned where ground support had been installed to control the ground constitutes more than ordinary negligence and is and unwarrantable failure to comply with a mandatory standard.

This citation was terminated on March 20, 2007. Management has established procedures and controls to ensure that persons can safely perform the task of roof bolting.

Approved By:

_____ _____

Arthur L. Ellis Date

APPENDICES

A. Persons Participating in the Investigation
B. Map of the Vicinity of the Fatal Roof Fall
C. Map of the Fault Zone
D. Diagram of Roof Bolter

APPENDIX A

Teck Cominco American Inc

Mark A. Thompson	director, safety & health
Brad N. Davenport	senior safety coordinator
Sandy B. McFarlane	senior safety coordinator
Kevin E. Kinsella	environmental health & safety superintendent
Mark J. Brown	general manager
David E. Riggleman	mine superintendent
Ray W. Bloomer	miner's representative
Mace G. Thiuierge	miner's representative
Christine L. Mulligan	surveyor

J.S. Redpath Corp.

Edward J. Salvas	safety supervisor
Mark S. Immonen	senior manager of operations
Fern C. Larosie	project superintendent
John R. Rhodes	mine captain
Chris C. Hickey	general manager
Adele L. Abrams	attorney
Margaret S. Lopez	attorney

Metaline Falls Fire District #2

Scott D. Doughty	paramedic

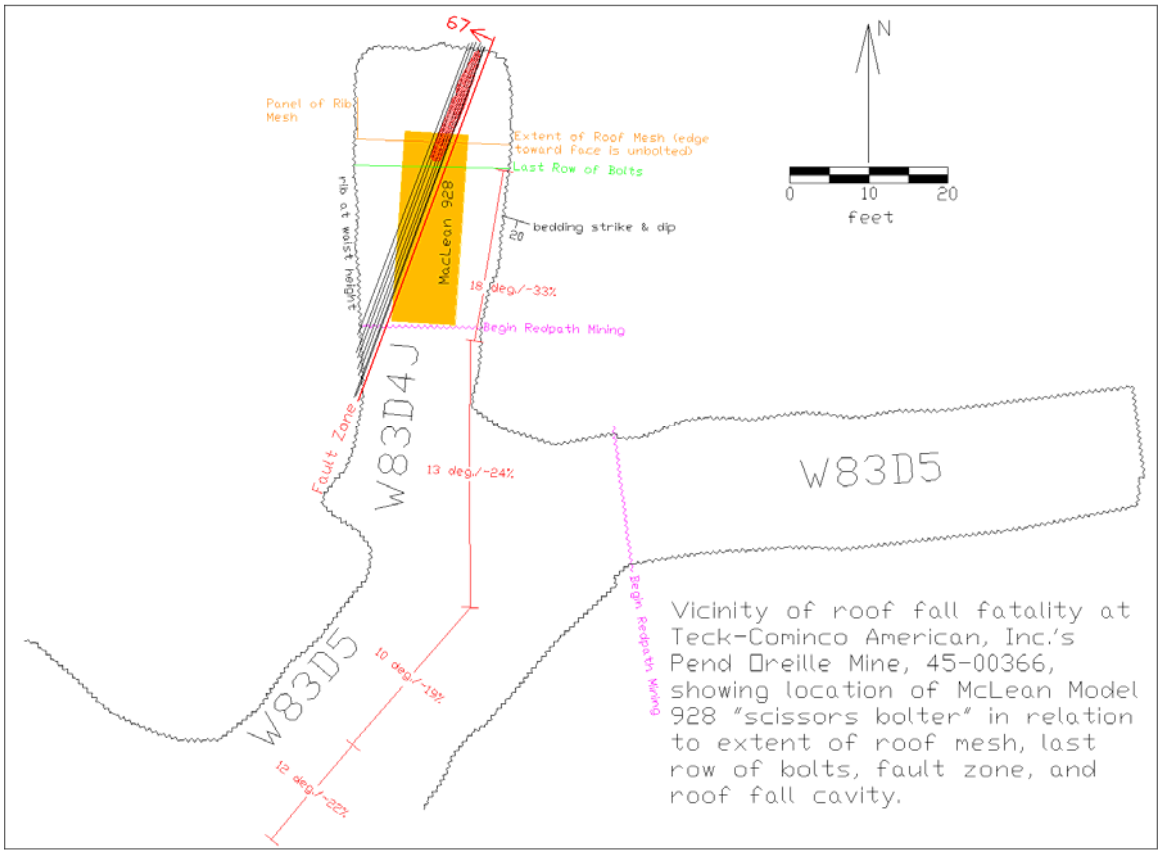
Pend Oreille County Sheriff's Office

Eric J. Schutte	deputy sheriff

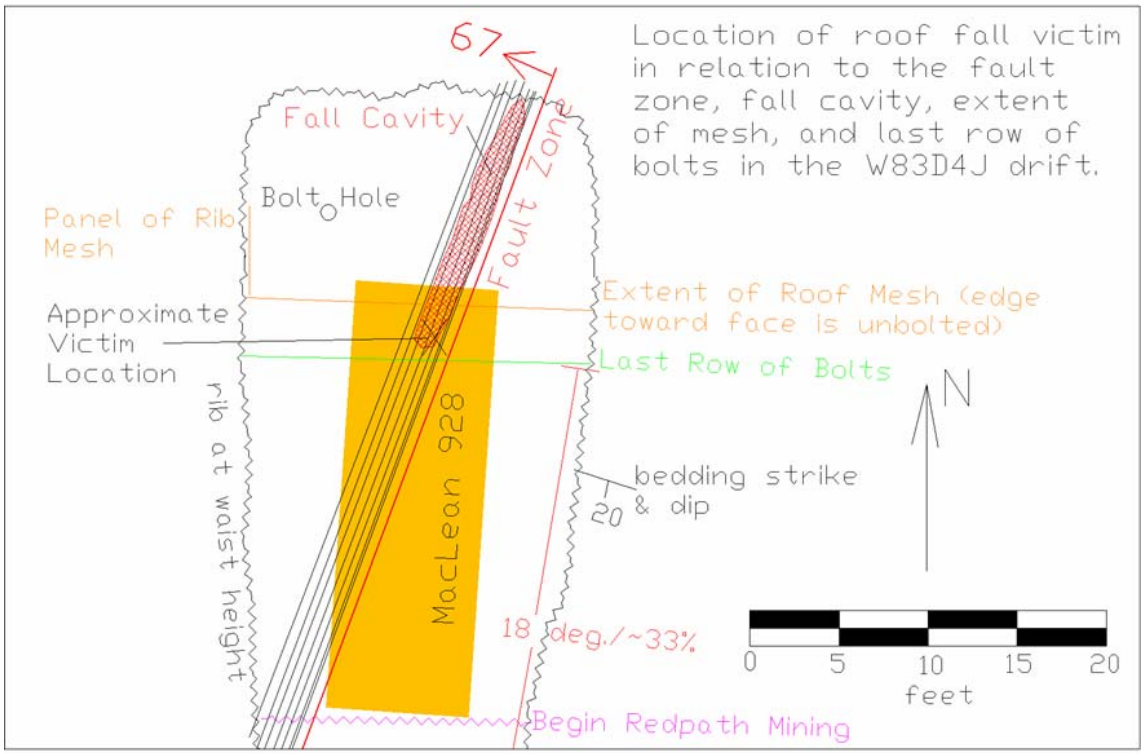
Mine Safety and Health Administration

Randy L. Cardwell	supervisory mine safety and health inspector
David J. Small	mine safety and health inspector
Ron Eastwood	mine safety and health inspector
Sandin E Phillipson	geologist
William J. Gray	mining engineer
Melvin K. Palmer	mine safety and health specialist

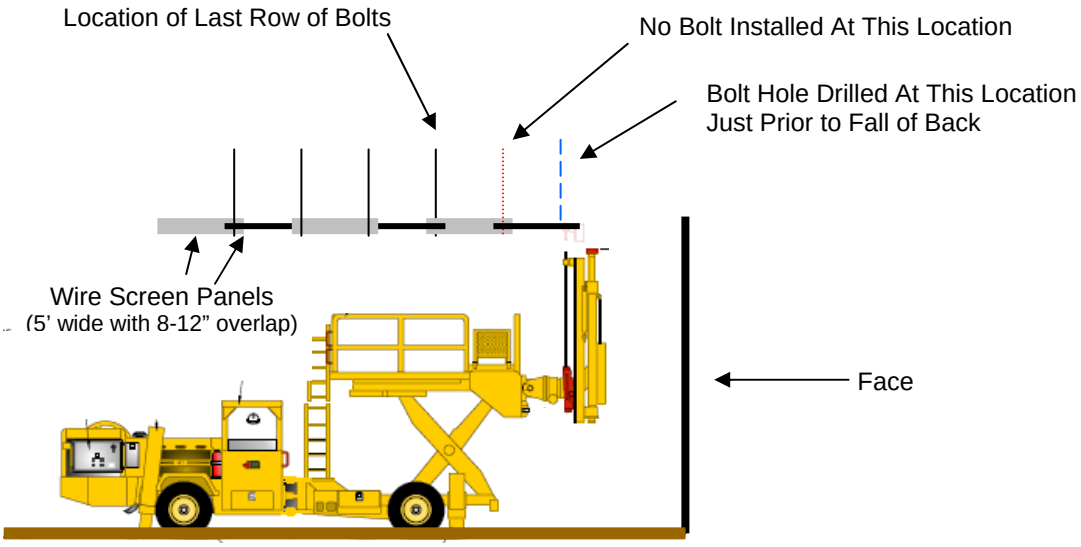
APPENDIX B


67
N
0
10
20
feet
Panel of Rib Mesh
Extent of Roof Mesh (edge toward face is unbolted)
Last Row of Bolts
rib at waist height
McLean 928
20
bedding strike & dip
18 deg./-33%
Begin Redpath Mining
Fault Zone
W83D4J
13 deg./-24%
W83D5
W83D5
10 deg./-19%
12 deg./-22%
Redpath Mining
Vicinity of roof fall fatality at Teck-Cominco American, Inc.'s Pend Oreille Mine, 45-00366, showing location of McLean Model 928 "scissors bolter" in relation to extent of roof mesh, last row of bolts, fault zone, and roof fall cavity.

APPENDIX C


Location of roof fall victim in relation to the fault zone, fall cavity, extent of mesh, and last row of bolts in the W83D4J drift.
67
Fall Cavity
Fault Zone
Bolt Hole
Panel of Rib Mesh
Approximate Victim Location
Extent of Roof Mesh (edge toward face is unbolted)
Last Row of Bolts
N
bedding strike & dip
20
MacLean 928
rib at waist height
18 deg./~33%
0 5 10 15 20
feet
Begin Redpath Mining

APPENDIX D



Approximate relationship of bolter work platform to last row of bolts, bolt being installed, and face position. (Does not show slope of entry)

APPENDIX E

Accident Investigation Data - Victim Information

Event Number: 1 1 3 1 8 2 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. Last Four Digits of SSN:	5. Degree of Injury:
PHILLIP O. MARKHART	M	43	7193	01 Fatal

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death:	7. Date and Time Started:
a. Date: 01/25/2007 b.Time: 2:20	a. Date: 01/24/2007 b.Time: 16:30

8. Regular Job Title:	9. Work Activity when Injured:	10. Was this work activity part of regular job?
047 ROOF BOLTER HELPER	078 ROOF BOLTER INSERTING BOLT	Yes X No

11. Experience	a. This Work Activity:	b. Regular Job Title:	c: This Mine:	d. Total Mining:
Years	0	1	0	7
Weeks	0	0	0	0
Days	1	0	2	0

12. What Directly Inflicted Injury or Illness?	13. Nature of Injury or Illness:
121 FALL OF GROUND FROM THE BACK	170 CRUSHING INJURY

14. Training Deficiencies:

Hazard: | New/Newly-Employed Experienced Miner: X | Annual: | Task:

15. Company of Employment:(If different from production operator)

J S REDPATH

Independent Contractor ID: (if applicable) R83

16. On-site Emergency Medical Treatment:

Not Applicable: | First-Aid: | CPR: | EMT: X | Medical Professional: | None:

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

18. Union Affiliation of Victim: 9999 None (No Union Affiliation)