

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

**REPORT OF INVESTIGATION
Underground Metal Mine
(Lead/Zinc)**

**Fatal Fall of Roof Accident
January 21, 2015**

**The Doe Run Company
Fletcher Mine
Bunker, Reynolds County, Missouri
MSHA I.D. Number 23-00409**

Accident Investigators

**Michael R. Van Dorn
Supervisory Mine Safety and Health Inspector**

**Jeremy Kennedy
Mine Safety and Health Inspector**

**James G. Vadnal
Mining Engineer**

**Gregory M. Rumbaugh, P.E.
Civil Engineer**

**David Weaver
Assistant District Manager**

**Originating Office
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South Central District
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Michael A. Davis, District Manager**



OVERVIEW

On January 21, 2015, John D. Hoodenpyle, Mechanical Scaler, age 54, was killed when a section of rock fell from the back/roof, collapsing the protective structure on a scaling machine. Hoodenpyle was operating a mechanical scaler (scaler) in the RC3PO Northeast drift when approximately 175 tons of material fell, covering the machine.

The accident occurred due to management's failure to identify hazardous ground conditions and to design and install an adequate support system that controlled the ground in the RC3PO Northeast area, where persons worked or traveled in performing their assigned tasks. Management did not ensure that miners scaled the roof from a safe location.

GENERAL INFORMATION

Fletcher Mine, an underground lead-zinc mine owned and operated by The Doe Run Company, is located in Bunker, Reynolds County, Missouri. The principal operating official is Steve Batts, General Manager. The mine operates two 10-hour shifts per day, seven days a week. Total employment is 110 persons.

The ore body at this mine is drilled and blasted. Front-end loaders load the material into haul trucks that transport it to the production shaft. The ore is hoisted by skip to the surface where it is crushed and conveyed to the mill. Lead, zinc, and copper concentrates are then separated by a floatation process. The finished products are sold for use in the manufacturing industry.

The Mine Safety and Health Administration (MSHA) completed its last regular inspection of this operation on November 11, 2014.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, January 21, 2015, John Hoodenpyle (victim) started work at 5:00 p.m., his regular starting time. Hoodenpyle and several other miners went underground to the office to receive their work assignments from John Chitwood, Foreman. Hoodenpyle was assigned to complete some scaling that the previous shift had begun and then to start scaling in the RC3PO drift.

At approximately 10:00 p.m., Tom Welch, Loader Operator, observed Hoodenpyle conducting a workplace examination in the RC3PO drift. Sam McCabe, Driller, and Ryan Bowden, Powder Man, were repairing a drill in the adjacent entry about 90 feet away but did not see Hoodenpyle enter the area with the scaler. All three miners reported hearing the scaler strike the roof in the RC3PO drift, indicating that Hoodenpyle had begun the scaling process.

At 10:15 p.m., Welch and Bowden decided to go to the shop to get additional help with the drill repairs and walked to their vehicle parked near the RC3PO drift. As Welch and Bowden approached the RC3PO drift, they heard the roof fall but were not in position to observe the fall. However, they did see rock and dust in the drift as a result of the fall. After the dust cleared, they could see the rock on top of the scaler.

Welch, who had been operating his loader about 70 feet away, also heard the roof fall. He stopped the loader, did not hear any noise coming from the scaler, and started backing up the machine to look toward the scaler. Welch saw McCabe and Bowden running toward him, flashing their lights and yelling that the scaler was covered up and to call for help.

Welch had to travel about 300 feet to gain radio signal to contact Chitwood. He told Chitwood that rock hit the scaler. Chitwood went to the area and found that the fall had smashed the cab's Rollover Protection Structure (ROPS) / Falling Object Protective Structure (FOPS) and that Hoodenpyle was still inside. Rock was still falling in the area, as Chitwood directed McCabe to ribbon off the area. Chitwood went to the shop to notify Pauline Gorden, Hoist Operator, of the accident.

Chitwood told Gordon to notify MSHA and The Doe Run management of the accident. The Doe Run Mine Rescue team was called at approximately 11:30 as the recovery process began. To ensure scene safety, a mechanical scaler was brought to scale all adjacent areas near the accident site. After the area was scaled, a 980 H Caterpillar frontend loader was used to clear rock on and around the damaged scaler allowing it to be pulled back to a safe location. The victim was transported to the surface at approximately 12:50 PM on the following day. The Coroner, staying on the surface, received the body, pronouncing the victim dead as "immediate" due to massive head and chest injuries.

INVESTIGATION OF THE ACCIDENT

MSHA was notified of the accident at 10:50 p.m. on January 21, 2015, by a telephone call from Pauline Gorden, Hoist Operator, to MSHA's National Call Center. The National Call Center notified William Odell, Mine Safety and Health Specialist, and an investigation was started the same day. To ensure the safety of all persons, an order was issued pursuant to section 103(j) of the Mine Act. This order was later modified to a section 103(k) of the Mine Act after the arrival of an Authorized Representative at the mine site.

MSHA's investigators 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, mine employees, and miners' representatives.

DISCUSSION

RC3PO Northeast Section

The accident occurred in the RC3CPO Northeast working section. The roof fall was approximately 55-foot long and 20-foot wide. The height of the fall extended to a maximum of six feet at the center of the cavity. The majority of the fall cavity ranged in height from 2 to 4 feet. The single-level drift, where the fall took place, was being advanced to the southeast (Figure 1). The fall area is described as the drift at pillar number 7517B (Side B). The roof at the accident scene consisted of brecciated dolomite that fell in large pieces (Figure 2). The estimated weight of the fallen material was approximately 175 tons.

Approximately 25% of the fall area was previously supported. Eight holes, where bolts were previously installed, were observed in the fall cavity furthest from the face. Eight, 6-foot long, 1½-inch diameter, friction stabilizer-type roof supports were located in the material that was removed from the fall area. An additional friction stabilizer was located in the vicinity of the accident but the investigators could not determine if it was installed in the fall zone.

Roof Conditions

There are various types of roof encountered at the Fletcher Mine. The predominant roof type is a horizontally-bedded (layered) dolomite, which creates favorable roof conditions (Figure 5). Six-foot long friction stabilizers are typically installed on a nominal five-foot by five-foot pattern. The purpose of the friction stabilizers is to hold the horizontally-bedded dolomite strata together to control the roof.

In other areas of the mine, shale layers are found in the roof. These areas are recognized as being associated with adverse ground conditions, and are referred to as being "shaley" by the miners. Persons interviewed stated that the roof bolter operators have been instructed to change from the friction stabilizers to six-foot-long fully-grouted resin rock bolts in these areas. The ground support spacing and when to change to fully-grouted bolts is left to the judgment and discretion of the roof bolt operators.

These two types of bolts, friction stabilizers and fully-grouted resin rock bolts, have different support characteristics. The operator's roof bolt manufacturer conducted roof bolt anchorage pull tests in several of the region's mines during April and May, 2014. Pull tests were completed on different types of ground support in three areas of the mine.

Documentation from these tests indicated that six-foot-long, 1½-inch diameter, friction stabilizers in the RC3CPO Northeast section yielded at a range between 6 and 8 tons of force. In the RC19 section, 6-foot long, fully-grouted, No. 6 headed-rebar rock bolts yielded at 14 tons. In the 67C230 North section, six-foot long, fully-grouted, No. 7 headed-rebar rock bolts yielded at 20 tons. In the case of the friction stabilizer, it can be concluded that "yield" is actually the maximum anchorage capacity of the bolt at that location. For the fully-grouted bolts, the "yield" point from the pull tests coincides with the rebar yield strength, meaning that anchorage capacity was not exceeded. This test data on bolt anchorage capacity reinforces the conclusion that the friction stabilizers did not have sufficient anchorage capacity to suspend the weak ground in the area of the fall.

Geology

Ore is extracted from strata-bound deposits found in dolomitized carbonate rocks. Mining takes place in the "5 Zone" of the Upper Cambrian-aged Bonneterre Formation which ranges from 15 to 50 feet thick. The Bonneterre Formation is typically a light gray medium-to fine-grained dolomite. Parts of the formation are reported to be "shaley". The shale is normally found in beds less than two inches thick. In the New Lead Belt area, eight principal ore units are recognized, though not all are identifiable at any one location. Sedimentary structural features such as facies changes, jointing zones, reefs, and collapse breccias are the areas where ore bodies are concentrated within the dolomite.

Each of the ore bodies in the New Lead Belt are one to five miles long and from 200 to 3,000 feet wide. The depth of the ore bodies range from 800 feet to 1,200 feet, generally reflecting changes in the surface topography. These ore bodies are irregular tabular masses of sulfide ores and consist of primarily galena with smaller quantities of sphalerite and copper sulfides. According to The Doe Run Company's publication "The Viburnum Trend: A World-Class Pb-Zn-Cu MVT District In SE Missouri, USA," these ore bodies can have "numerous breccia and pseudobreccia [breccia-like] throughout the mine which can vary from early features such as intraclastic sedimentary breccias and burrowed zones, to veined stockwork breccias, green shale breccias and matrix breccias." Breccia is a geologic term for rock consisting of angular fragments (interclasts) of dolomite that are embedded in a finer ore matrix.

Mining Methods

The ore is extracted using room and pillar mining methods with drifts ranging from 28 to 32 feet wide. The pillars are square and have dimensions ranging from 25 to 30 feet on each side for a total extraction ratio of approximately 75%. Mining is advanced conventionally by drilling and blasting the ore in 15 to 16-foot-deep rounds. The material is removed from the face (mucked) by front-end loaders, loaded into haul trucks, and transported from the working area. The back (roof), ribs, and face are then scaled by a mechanical scaler. After scaling, roof support is installed.

Getman Mechanical Scaler S330

The scaler involved in the accident is a Getman mechanical scaler model number S330. The mechanical scaler has a roof scaling coverage range of 9.8 feet to 29.5 feet, and a rib scaling coverage ranging up to 29.5 feet. The single extension boom allows an advance over 13.1 feet from a single setup. The scaler with boom is approximately 40 feet long and 8 feet high. An examination of the scaler during an MSHA inspection from the previous day of the accident, found the scaler to be in good operational condition and there were no obvious pre accident damage to the ROPS/FOPS on the machine.

TRAINING AND EXPERIENCE

John Hoodenpyle had 4 years and 20 weeks of mining experience, all at this mine. A representative of MSHA's Educational Field Services and Small Mines conducted a review of the mine operator's training records including the training records for Hoodenpyle. All of the required MSHA Training, including Annual Refresher Training and Task Training, were 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 establish policies and procedures for identifying hazardous ground conditions. Prior to the accident, miners were not required to drill test holes at each intersection in order to identify adverse ground conditions.

Corrective Action: Management established new policies and procedures for identifying hazardous ground conditions and trained miners to drill test holes at the beginning of each drilling cycle to identify any separation in the roof strata. The test holes are required to be drilled, as near to vertical as possible, and shall extend no less than one foot longer than the support installed. The hole will be visibly marked/ identified and the results of the examination will be recorded on the workplace examination record.

Root Cause: Management failed to design and install adequate support to control the roof in the disrupted bedding of the brecciated zone of the back (roof) in the RC3PO Northeast area where persons worked or traveled in performing their assigned tasks.

Corrective Action: Management established new policies and procedures requiring test holes to be drilled at the beginning of each drilling cycle to identify any separation in the roof strata. The test holes are required to be drilled, as near to vertical as possible, and shall extend no less than one foot longer than the support installed. The hole will be visibly marked/ identified and the results of the examination will be recorded on the workplace examination record.

These new policies and procedures require the roof and ribs to be supported using six-foot long, fully-grouted, No. 7 resin bolts, or bolts with a greater strength and anchorage capacity within 30 feet of the face of the drift in areas of disrupted bedding in breccia zones. In areas with stable back conditions, bolts will be kept up to within 100' of the work face. In single development headings, with stable back conditions, bolts will be kept up to within 200' of the work face.

Management will determine the type of roof support to be installed that will adequately support the roof. All miners were trained in these new policies and procedures.

Root Cause: Management failed to ensure that miners performed scaling operations from a safe location that would not expose them to falling material.

Corrective Action: Management established a new procedure that requires scaling operations to be conducted from a safe location that does not expose miners to falling material. The new roof control procedures requiring limited distances for unbolted areas will ensure a safe location for scaling operations. Miners were trained in this new procedure.

CONCLUSION

The accident occurred due to management's failure to identify hazardous ground conditions and to design and install adequate support to control the roof in the disrupted bedding of the brecciated zone of the roof in the RC3PO Northeast area where persons worked or traveled in performing their assigned tasks. Management did not ensure that miners scaled the roof from a safe location.

ENFORCEMENT ACTIONS

Issued to The Doe Run Company

Order No. 8775428 - Issued January 21, 2015, 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:

A fatal accident involving a Getman Scaler in the RC3PO heading trapping a miner inside the scaler. All persons are prohibited from entering the mine with the exception of a six person mine rescue witch must coordinate with the fresh air base to determine if the area can be entered safely. A 103 j verbal was issued to Pauline Gordon – hoist operator at 2310 this action is being taken to reduce that order to writing.

Citation No. 8680899 - Issued under the provisions of section 104(a) of the Mine Act for a violation of 30 CFR 57.3201:

A fatal accident occurred at this mine on January 21, 2015, when falling material from the roof struck a Getman Mechanical Scaler. The scaler was being operated from a location which exposed the operator to falling material. The roof fall was 55 feet long x 20 feet wide x 6 feet thick and caused the roll-over protective structure (ROPS) on the scaler to collapse.

Citation No. 8680900 - Issued under the provisions of section 104(a) of the Mine Act for a violation of 30 CFR 57.3360:

A fatal accident occurred at this mine on January 21, 2015, when falling material from the roof struck a Getman Mechanical Scaler that was being operated by the victim to scale the roof. The roof fall was 55 feet long x 20 feet wide x 6 feet thick. The six-foot-long, 1 1/2-inch-diameter, friction stabilizer-type roof supports that had been previously installed pulled out in full length showing failure in their holding capabilities. The Mine Operator failed to design and install an adequate support system that controlled the ground in the RC3PO Northeast area where persons worked or traveled in performing their assigned tasks. Other miners were working in the area when the roof fall occurred.

Approved: _____



Michael A. Davis
District Manager

Date: _____

6/10/15

APPENDIX A

PERSONS PARTICIPATING IN THE INVESTIGATION

The Doe Run Company

Jason England	Safety Manager
Tom Yanksey	Technical Services
Clay McNail	General Mine Superintendent
Randy Hanning	General Mine Foreman
Bob Ridings	Geologist
Amy Medlock	Safety

Steelman, Gaunt & Horsefield

Ryan Seelke	Attorney for The Doe Run Company
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Missouri Department of Labor Standards

Rick Gillian	State Mine Inspector
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Mine Safety and Health Administration

Michael R. Van Dorn	Supervisory Mine Safety and Health Inspector
Jeremy Kennedy	Mine Safety and Health Inspector
James G. Vadnal	Mining Engineer
Gregory M. Rumbaugh, P.E.	Civil Engineer
Crag Bergonzoni	Mine Safety and Health Inspector
Steven Brill	Mine Safety and Health Specialist (Training)
David Weaver	Assistant District Manager

APPENDIX B

Figure 1

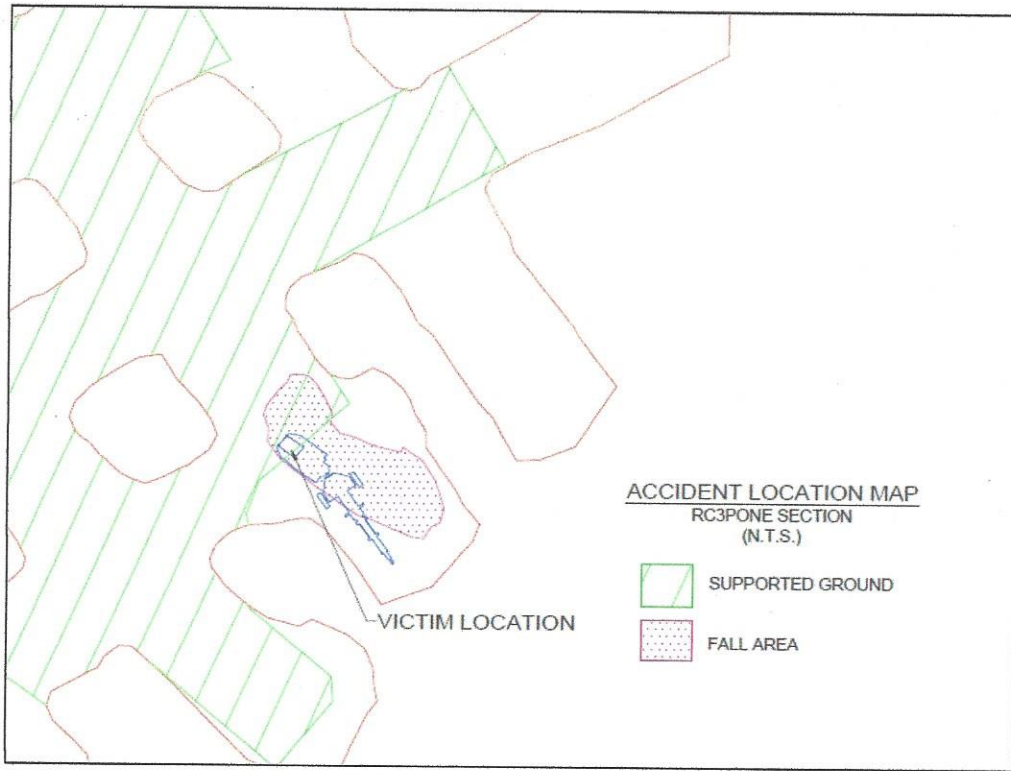
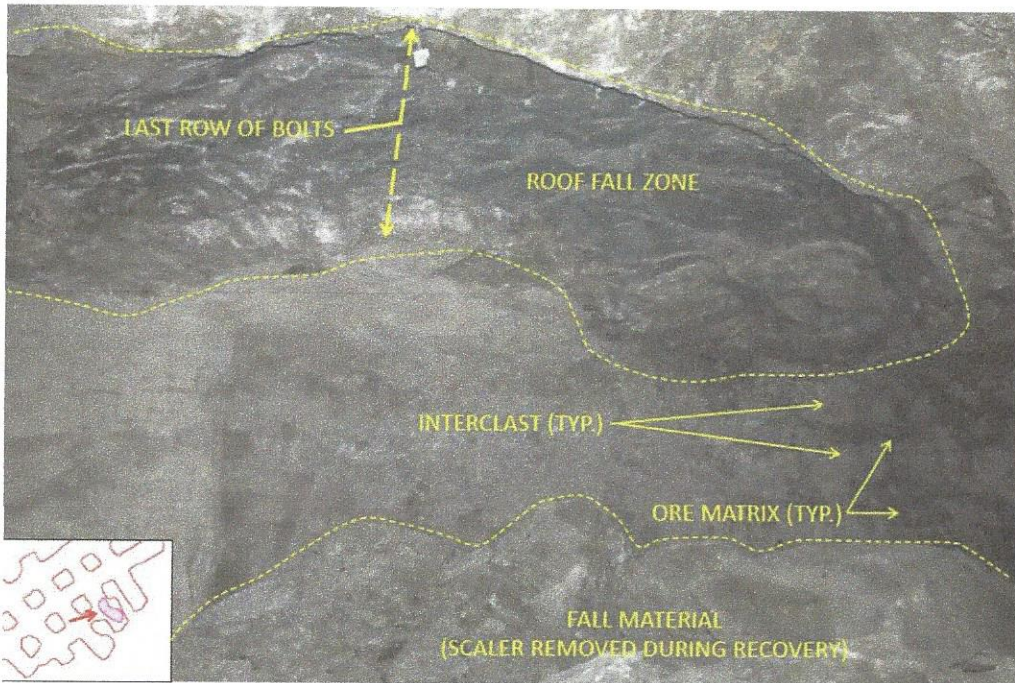


Figure 2



APPENDIX C

Accident Investigation Data - Victim Information

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



Event Number: <input type="text" value="6"/> <input type="text" value="6"/> <input type="text" value="5"/> <input type="text" value="4"/> <input type="text" value="8"/> <input type="text" value="7"/> <input type="text" value="7"/>																	
Victim Information: <input type="text" value="1"/>																	
1. Name of Injured/Ill Employee: <i>John D. Hoodenpyle</i>			2. Sex: <i>M</i>	3. Victim's Age: <i>54</i>		4. Degree of Injury: <i>01 Fatal</i>											
5. Date(MM/DD/YY) and Time(24 Hr.) Of Death: a. Date: <i>01/21/2015</i> b. Time: <i>22:20</i>						6. Date and Time Started: a. Date: <i>01/21/2015</i> b. Time: <i>22:20</i>											
7. Regular Job Title: <i>078 Ground control in all areas of the mine</i>				8. Work Activity when Injured: <i>073 Mechanical scaler</i>				9. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>									
10. Experience a. This			Years	Weeks	Days	b. Regular	Years	Weeks	Days	c. This	Years	Weeks	Days	d. Total	Years	Weeks	Days
Work Activity:			<i>2</i>	<i>4</i>	<i>0</i>	Job Title:	<i>2</i>	<i>4</i>	<i>0</i>	Mine:	<i>4</i>	<i>2</i>	<i>0</i>	Mining:	<i>4</i>	<i>2</i>	<i>0</i>
11. What Directly Inflicted Injury or Illness? <i>121 Roof fall onto machine</i>						12. Nature of Injury or Illness: <i>170 Large roof fall onto cab of machine</i>											
13. Training Deficiencies: Hazard: <input type="checkbox"/> New/Newly-Employed Experienced Miner: <input type="checkbox"/> Annual: <input type="checkbox"/> Task: <input type="checkbox"/>																	
14. Company of Employment: (If different from production operator) <i>Operator</i>						Independent Contractor ID: (if applicable)											
15. On-site Emergency Medical Treatment: Not Applicable: <input type="checkbox"/> First-Aid: <input type="checkbox"/> CPR: <input type="checkbox"/> EMT: <input checked="" type="checkbox"/> Medical Professional: <input type="checkbox"/> None: <input type="checkbox"/>																	
16. Part 50 Document Control Number: (form 7000-1)						17. Union Affiliation of Victim:											