

**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 Ore)**

**Fatal Powered Haulage Accident
April 3, 2007**

**Doe Run Company
Brushy Creek Mine and Mill
Bunker, Reynolds County, Missouri
Mine ID No. 23-00499**

Investigators

**Michael R. VanDorn
Supervisory Mine Safety and Health Inspector**

**Robert D. Seelke
Supervisory Mine Safety and Health Inspector**

**James L. Angel
Mechanical Engineer**

**Originating Office
Mine Safety and Health Administration
South Central District
1100 Commerce Street, Room 462
Dallas, TX 75242-0499
Edward E. Lopez, District Manager**

Overview

On April 3, 2007, James D. Jones, haul truck driver, age 40, was fatally injured when the haul truck he was operating left the road and overturned. Jones was not wearing a seat belt at the time of the accident.

The accident occurred because management policies and procedures failed to ensure that all braking systems on the truck were maintained in a functional condition. The truck was traveling with defective brakes on a grade steeper than that recommended by the manufacturer. Berms were not maintained along the elevated portions of the road. The failure of the driver to wear a seat belt contributed to the severity of his injuries.

GENERAL INFORMATION

Brushy Creek Mine and Mill, an underground lead-zinc mine, owned and operated by Doe Run Company, was located at Bunker, Reynolds County, Missouri. The principal operating official was Robert W. Roscoe, general manager. The mine operated multiple shifts, 24 hours a day, 7 days per week. Total employment was 138 persons.

Lead-zinc ore was mined underground and hoisted to the surface. The ore was milled on site to form a concentrate. The finished product was shipped to a smelter where it was refined for a variety of industrial uses.

Mill tailings were pumped behind a dam located about one mile from the mill. A remediation crew was raising the level of the dam using broken rock from a local quarry. The crew was employed by Doe Run Company but was not permanently assigned to the mine. The crew consisted of a project coordinator, a lead man, and three haul truck drivers. James Jones was one of the haul truck drivers. They had been working at the mine for two weeks.

The last regular inspection at this operation was completed on February 23, 2007.

DESCRIPTION OF ACCIDENT

On the day of the accident, James Jones (victim) reported for work at 7:00 a.m., his normal starting time. He was assigned to haul broken rock from the mine stockpile to the toe of the tailings dam, a distance of about 0.7 miles.

The haul truck Jones intended to drive had a flat tire so he performed other tasks until the truck was ready. About 9:45 a.m., he began hauling using a route that included a stretch of road constructed and used the previous day. Jones was making a round trip in about 25 minutes and made 4 or 5 trips before taking a lunch break at noon.

About 12:30 p.m., Jones started hauling again and made another 4 or 5 trips. About 2:15 p.m., Anthony Parry, haul truck driver, noticed Jones at the top of an approximate 1000-foot grade approaching the dam. The truck Jones was driving appeared to be gaining speed as it descended the grade. The truck left the road at a right-hand curve and rolled down the steep side slope of the road. Parry went to the stockpile area to notify Karl Payne, excavator operator and lead man, about the accident. Payne contacted the maintenance shop and asked for help.

Employees responded and found the haul truck on its left side and partially submerged in a seep pond near the toe of the tailings dam. Jones was submerged in the water and was not found until about 4:15 p.m. when employees partially drained the pond. Jones' torso was in the truck cab and his legs were outside, pinned beneath the engine compartment. Investigators determined that he was ejected through the truck's windshield.

A ramp of broken rock was constructed to facilitate raising the truck off Jones. The Reynolds County Coroner pronounced Jones dead about 5:40 p.m. The cause of death was crushing injuries.

INVESTIGATION OF THE ACCIDENT

MSHA was immediately notified of the accident through Allen Govero, mine safety and health inspector, who was conducting a spot inspection and had just exited the underground mine. Govero notified Robert Seelke, supervisory mine safety and health inspector, at 2:35 p.m. and an investigation was started the same day. An order was issued pursuant to section 103(k) of the Mine Act to ensure the safety of the miners. An accident investigation team from MSHA 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 at the south side of the main tailings dam. Skies were clear to partly cloudy and the ground conditions were dry.

Travel Route and Road

Two trucks were loaded by excavator with broken rock from a stockpile located about 1,000 feet southwest of the mill. The trucks traveled about 0.7 miles from the stockpile to the main tailings dam. They then went down an approximate 1,000-foot section of road constructed on the outside slope of the southwest portion of the dam. This section of road had grades ranging from 9-26 percent before leveling out about 100 feet above the toe of the dam. At this point, the trucks traveled through a sharp right turn and continued level along the outside slope of the dam. At the northwest end of the dam, the trucks made a sharp left turn down the outside slope to dump at the base of the dam.

On the return trip, trucks traveled up the outside slope of the dam to a road near the top making a sharp right turn and traveling a level road the length of the dam. After reaching the far southeast end of the dam, the trucks traveled to the stockpile.

The accident occurred at the sharp right-hand turn above the toe of the dam. The road in that area was constructed of rock and mill tailings placed on the slope of the dam. The road was about 15 feet wide in the vicinity of the accident but no berm was provided along the outer edge where it dropped off to the toe of the dam.

Haul Truck

The haul truck involved in the accident was an articulated 1995 6-wheel Moxy off-road model MT30S-3. It consisted of a cab section and trailer section totaling about 30 feet

long, 9 feet wide, and 11 feet high. The truck weighed about 20 tons and was designed for a maximum payload of 30 tons. It would have had an estimated loaded weight of about 44 tons based on the typical load hauled.

The truck was powered by a 262-horsepower 6-cylinder diesel engine. Investigators were unable to start the engine for full testing because the truck was extensively damaged. The mirrors, air cleaner, wiring, hoses, exhaust piping, right front wheel suspension, tandem housing for the left rear wheels, steering wheel and shaft, and the engine mounts were all damaged as a result of the accident.

The truck was equipped with an electronically controlled automatic transmission with six forward gears and one reverse gear. When the gear shift lever was placed in "D", the transmission would automatically shift between the six forward gears in accordance with the truck speed and engine revolutions per minute. When placed in 1st, 2nd, or 3rd gear, the transmission would not automatically shift into another gear. Investigators used a Moxy transmission testing unit and found several problems with the transmission that were determined to be caused by the accident.

The truck was equipped with an engine brake (exhaust retarder) consisting of a valve in the exhaust pipe that was designed to close whenever the accelerator pedal was released. This created back pressure to slow the engine and, with the transmission in gear and the transmission's torque converter lockup engaged, slowed the truck and prevented shifting to a higher gear.

The operator's manual for the truck indicated that it could travel safely on a maximum grade of 22 percent with a gross weight of 44 tons and the transmission in first gear. The engine brake capacity would be insufficient to control the truck speed if these parameters were exceeded.

The transmission testing unit was used to simulate activation of the engine brake, allowing investigators to determine that the exhaust pipe valve would not close. After removing and reinstalling an electrical plug leading to the brake valve, the exhaust pipe valve worked consistently upon retesting. Since there was no damage to the exhaust pipe valve or associated components, investigators concluded that the engine brake was not functional at the time of the accident.

The service brake system consisted of air over hydraulic operated calipers and discs at each of the six wheels. The front wheels had two calipers each and the other four wheels had one caliper each. The front and rear circuits were separate with their own air and fluid reservoirs. The entire braking system was activated by pushing one foot pedal in the truck cab. Investigators determined that the service brakes were functional at the time of the accident but may have suffered some loss of effectiveness since other employees reported the smell of overheated brakes afterward.

The parking brake system consisted of a spring-applied, air-released, caliper and disc on the trailer section drive shaft that was activated by a lever in the cab. Investigators found the parking brake set and determined that it was functional at the time of the accident. Discoloration and warping of the disc led them to conclude that it had been very hot.

The truck was equipped with a certified roll-over protective structure (ROPS) and operator's seat belt. The ROPS had been modified by welding a pipe to it for fire extinguisher storage. The seat belt latched and unlatched without difficulty and retracted and locked properly when tested. The victim was not wearing the seat belt at the time of the accident.

Training and Experience

James Jones had 1 year and 34 weeks experience operating haul trucks for Doe Run Company at various project sites. Some of the sites were under the jurisdiction of MSHA and others were not. Jones worked at this operation for two weeks but had not received training in accordance with 30 CFR, Part 48. He had previously received training in accordance with 30 CFR, Part 46.

ROOT CAUSE ANALYSIS

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

Root Cause: Work policies and procedures were inadequate and failed to ensure that all braking systems on the haul truck were maintained in a functional condition.

Corrective Action: Management should initiate policies and procedures to ensure that all mobile equipment is inspected by the equipment operator before being placed in operation and that all safety defects are repaired in a timely manner.

Root Cause: Work policies and procedures were inadequate and failed to ensure that a haul truck was operated on grades compatible with the truck's specifications. The operator's manual, indicating appropriate grades for various payloads, was not available on the truck.

Corrective Action: Management should provide an operator's manual for all mobile equipment and ensure that the equipment is operated consistent with the manufacturer's recommendations.

Root Cause: Work policies and procedures were inadequate and failed to ensure that berms or guardrails were provided where a drop-off existed of sufficient grade or depth to cause a vehicle to overturn.

Corrective Action: Management should develop and implement policies to ensure that berms are provided where a drop-off exists of sufficient grade or depth to cause a vehicle to overturn.

Root Cause: The driver of the haul truck failed to wear his seat belt while operating the truck.

Corrective Action: Management should strengthen their mandatory seat belt requirements by checking mobile equipment operators more frequently.

CONCLUSION

The accident occurred because management policies and procedures failed to ensure that all braking systems on the truck were maintained in a functional condition. The truck was operating on a road where berms were not maintained along the elevated portions, the engine brake was defective, and the truck was traveling on grades steeper than those recommended by the manufacturer. The victim was not wearing a seat belt which contributed to the severity of his injuries.

ENFORCEMENT ACTIONS

Order No. 6242344 was issued on April 3, 2007, under the provisions of Section 103(k) of the Mine Act:

A fatal accident occurred on April 3, 2007, when an articulating haul truck overturned while attempting to navigate the haul road. This order is issued to assure the safety of all persons at this operation. It prohibits all activity at the seep pond area until MSHA has determined that it is safe to resume all mining activities in this area. The mine operator shall obtain prior approval from an Authorized Representative for all actions to recover and or restore operations to the affected area.

This order was terminated on May 21, 2007, after conditions that contributed to the accident no longer existed.

Citation No. 6242349 was issued on April 27, 2007, under the provisions of Section 104(a) of the Mine Act for a violation of 57.9300(a):

A fatal accident occurred at this mine on April 3, 2007, when a haul truck left the road and overturned as it was traveling down a grade. A berm or a guardrail was not provided for a distance of about 200 feet along the outer edge of the elevated road.

This citation was terminated on May 21, 2007, after a berm of sufficient height was built along the elevated roadway near the toe of the tailings dam.

Citation No. 6242350 was issued on April 27, 2007, under the provisions of Section 104(a) of the Mine Act for a violation of 57.14101(a)(3):

A fatal accident occurred at this mine on April 3, 2007, when a haul truck left the road and overturned as it was traveling down a grade. All braking systems on the haul truck were not maintained in functional condition in that the engine brake was not functional.

This citation was terminated on May 3, 2007, after the truck was permanently removed from service.

Citation No. 6242351 was issued on April 27, 2007, under the provisions of Section 104(a) of the Mine Act for a violation of 57.14131(a):

A fatal accident occurred at this mine on April 3, 2007, when a haul truck left the road and overturned as it was traveling down a grade. The driver was not wearing the seat belt provided in the truck and sustained fatal trauma injuries.

This citation was terminated on April 27, 2007, after the truck was permanently removed from service.

Citation No. 6242352 was issued on April 27, 2007, under the provisions of Section 104(a) of the Mine Act for a violation of 57.14205:

A fatal accident occurred at this mine on April 3, 2007, when a haul truck left the road and overturned as it was traveling down a grade. The truck was operated beyond the maximum grade recommended for the typical load it was carrying.

This citation was terminated on May 3, 2007, after portions of the haul road along the south slope of the tailings dam were removed from service.

Approved: _____

Edward E. Lopez
District Manager

Date: _____

APPENDIX A

Persons Participating in the Investigation

The Doe Run Company

| | |
|---------------|--|
| Dennis Murphy | safety director |
| Mark Nations | reclamation and special projects coordinator |
| Ronnie Parker | maintenance foreman |
| David Tucker | safety representative |

Mine Safety and Health Administration

| | |
|--------------------|--|
| Michael R. VanDorn | supervisory mine safety and health inspector |
| Robert D. Seelke | supervisory mine safety and health inspector |
| James L. Angel | mechanical engineer |

Appendix B

| Accident Investigation Data - Victim Information | | | | | | | | | | U.S. Department of Labor | | | | | |
|---|-------------------------------------|--------------------|--------------------|--|--|--|-------------------------------------|--|-------------------------------------|--|----------|---|----------|-----------|----------|
| Event Number: 1 0 4 1 8 0 4 | | | | | | | | | | Mine Safety and Health Administration | |  | | | |
| Victim Information: 1 | | | | | | | | | | | | | | | |
| 1. Name of Injured/Ill Employee: <i>James D. Jones</i> | | | 2. Sex <i>M</i> | 3. Victim's Age <i>40</i> | | 4. Last Four Digits of SSN: <i>0000</i> | | 5. Degree of Injury: <i>01 Fatal</i> | | | | | | | |
| 6. Date(MM/DD/YY) and Time(24 Hr.) Of Death: <i>a. Date: 04/03/2007 b. Time: 14:15</i> | | | | | 7. Date and Time Started: <i>a. Date: 04/03/2007 b. Time: 7:00</i> | | | | | | | | | | |
| 8. Regular Job Title: <i>076 Moxy 30 ton driver</i> | | | | 9. Work Activity when Injured: <i>055 Hauling shot rock to toe of dam</i> | | | | 10. Was this work activity part of regular job? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> | | | | | | | |
| 11. Experience | Years | Weeks | Days | b. Regular | Years | Weeks | Days | c. This | Years | Weeks | Days | d. Total | Years | Weeks | Days |
| a. This | | | | Job Title: | <i>1</i> | <i>34</i> | <i>1</i> | Mine: | <i>0</i> | <i>2</i> | <i>1</i> | Mining: | <i>1</i> | <i>34</i> | <i>1</i> |
| 12. What Directly Inflicted Injury or Illness? <i>002 Thrown from truck</i> | | | | | | | | 13. Nature of Injury or Illness: <i>170 Left side chest crushed</i> | | | | | | | |
| 14. Training Deficiencies: | | | | | | | | | | | | | | | |
| Hazard: | <input checked="" type="checkbox"/> | New/Newly-Employed | Experienced Miner: | <input checked="" type="checkbox"/> | Annual: | | Task: | <input checked="" type="checkbox"/> | | | | | | | |
| 15. Company of Employment:(If different from production operator) <i>Operator</i> | | | | | | | | | | Independent Contractor ID: (if applicable) | | | | | |
| 16. On-site Emergency Medical Treatment: | | | | | | | | | | | | | | | |
| Not Applicable: | | First-Aid: | | CPR: | | EMT: | <input checked="" type="checkbox"/> | Medical Professional: | <input checked="" type="checkbox"/> | None: | | | | | |
| 17. Part 50 Document Control Number: (form 7000-1) | | | | | 18. Union Affiliation of Victim: <i>9999 None (No Union Affiliation)</i> | | | | | | | | | | |
| Victim Information: | | | | | | | | | | | | | | | |
| 1. Name of Injured/Ill Employee: | | | 2. Sex | 3. Victim's Age | | 4. Last Four Digits of SSN: | | 5. Degree of Injury: | | | | | | | |
| 6. Date(MM/DD/YY) and Time(24 Hr.) Of Death: | | | | | 7. Date and Time Started: | | | | | | | | | | |
| 8. Regular Job Title: | | | | 9. Work Activity when Injured: | | | | 10. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input type="checkbox"/> | | | | | | | |
| 11. Experience | Years | Weeks | Days | b. Regular | Years | Weeks | Days | c. This | Years | Week | Days | d. Total | Years | Weeks | Days |
| a. This | | | | Job Title: | | | | Mine: | | | | Mining: | | | |
| 12. What Directly Inflicted Injury or Illness? | | | | | | | | 13. Nature of Injury or Illness: | | | | | | | |
| 14. Training Deficiencies: | | | | | | | | | | | | | | | |
| Hazard: | | New/Newly-Employed | Experienced Miner: | | Annual: | | Task: | | | | | | | | |
| 15. Company of Employment: (If different from production operator) | | | | | | | | | | Independent Contractor ID: (if applicable) | | | | | |
| 16. On-site Emergency Medical Treatment: | | | | | | | | | | | | | | | |
| Not Applicable: | | First-Aid: | | CPR: | | EMT: | | Medical Professional: | | None: | | | | | |
| 17. Part 50 Document Control Number: (form 7000-1) | | | | | 18. Union Affiliation of Victim: | | | | | | | | | | |
| Victim Information: | | | | | | | | | | | | | | | |
| 1. Name of Injured/Ill Employee: | | | 2. Sex | 3. Victim's Age | | 4. Last Four Digits of SSN: | | 5. Degree of Injury: | | | | | | | |
| 6. Date(MM/DD/YY) and Time(24 Hr.) Of Death: | | | | | 7. Date and Time Started: | | | | | | | | | | |
| 8. Regular Job Title: | | | | 9. Work Activity when Injured: | | | | 10. Was this work activity part of regular job? Yes <input type="checkbox"/> No <input type="checkbox"/> | | | | | | | |
| 11. Experience | Years | Weeks | Days | b. Regular | Years | Weeks | Days | c. This | Years | Week | Days | d. Total | Years | Weeks | Days |
| a. This | | | | Job Title: | | | | Mine: | | | | Mining: | | | |
| 12. What Directly Inflicted Injury or Illness? | | | | | | | | 13. Nature of Injury or Illness: | | | | | | | |
| 14. Training Deficiencies: | | | | | | | | | | | | | | | |
| Hazard: | | New/Newly-Employed | Experienced Miner: | | Annual: | | Task: | | | | | | | | |
| 15. Company of Employment:(If different from production operator) | | | | | | | | | | Independent Contractor ID: (if applicable) | | | | | |
| 16. On-site Emergency Medical Treatment: | | | | | | | | | | | | | | | |
| Not Applicable: | | First-Aid: | | CPR: | | EMT: | | Medical Professional: | | None: | | | | | |
| 17. Part 50 Document Control Number: (form 7000-1) | | | | | 18. Union Affiliation of Victim: | | | | | | | | | | |