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

REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Construction Sand and Gravel)

Fatal Falling Material Accident
April 11, 2012

GS Materials Inc.
Lemon Springs
Lemon Springs, Harnett County, North Carolina
Mine I.D. No. 31-01990

Investigators

Bill Handshoe
Supervisory Mine Safety and Health Inspector

Timothy Schmidt
Mine Safety and Health Inspector

Ricky Boggs
Mine Safety and Health Specialist

Jonathan Hall
Mechanical Engineer

Phillip McCabe
Mechanical Engineer

Originating Office
Mine Safety and Health Administration
Southeast District
135 Gemini Circle, Suite 212 Birmingham, Alabama 35209
Michael A. Davis, District Manager


CAT
349E
MPZ00417

OVERVIEW

On April 11, 2012, James T. McNeill, Equipment Operator, age 48, was injured when the counterweight from an excavator fell and struck him. McNeill and Randy White, Plant Manager, were removing bolts from the counterweight in preparation to move the excavator to another mine site. Following the removal of the last of six bolts, the counterweight dropped to the ground. The victim was hospitalized and died on April 12, 2012, as a result of his injuries.

The excavator was purchased about four to five weeks prior to the accident. On the day of the accident, it was to be transported to another mine, owned by the same operator. Due to weight restrictions on the highways, the counterweight had to be removed prior to shipping. The excavator was purchased with an optional hydraulic assist cylinder that allows the counterweight to be removed and reassembled easily and safely.

The accident occurred due to management's failure to follow the manufacturer's procedures for removing the counterweight from the excavator. The excavator was equipped with a hydraulic system that secures and lowers the heavy counterweight to the ground safely; however, this system was not used on the day of the accident. Raised components were not secured to prevent accidental lowering when persons were working on or around mobile equipment and exposed to the hazards of accidental lowering of the component. The victim did not receive task training regarding the procedures to be followed in the health and safety aspects of the task before performing the new task.

GENERAL INFORMATION

Lemon Springs, a surface construction sand and gravel mine, owned and operated by GS Materials Inc., is located in Lemon Springs, Harnett County, North Carolina. The principal operating official is Ronnie G. Kirkpatrick, Sr., President. The mine operates one 10-hour shift per day, five days per week. Total employment is 15 persons.

Excavators extract material from the pit. The highwall is scaled utilizing the excavator bucket. Excavators load the material into haul trucks and transport it to the plant for processing. The material is sized, screened, washed, and stock piled. Finished material is sold for various uses in the construction industry.

MSHA completed its last regular inspection at this operation on February 16, 2012.

DESCRIPTION OF THE ACCIDENT

On the day of the accident, April 11, 2012, James McNeill, (victim) reported to the mine at approximately 6:00 a.m., his normal starting time. McNeill reported approximately one hour before the other miners to grease and fuel the equipment. For the remainder of the morning, he hauled waste material using an articulating haul truck.

During the morning, three haul trucks and an excavator were scheduled to be transported to another mine owned by GS Materials Inc. A lowboy was brought to the mine around lunchtime. McNeill parked the truck he was operating and loaded the first haul truck on the lowboy and removed it from the mine. White picked up McNeill and drove to the pit area to prepare the excavator for transportation. McNeill drove the excavator to the shop area.

About 2:30 p.m., McNeill and White arrived at the shop. They went to the opening of the shop bay and gathered an impact wrench, sockets, and an air hose to remove the counterweight from the excavator. White went to the other side of the shop where he met a vendor. They spoke for a few minutes and White returned to the excavator where he found that McNeill removed one of the counterweight bolts on the left side of the counterweight (cab side). White removed three bolts on the right side and gave McNeill the impact wrench back to remove the remaining bolts.

At approximately 2:40 p.m., McNeill removed the last bolt from the counterweight. At that time, White heard a “pop” and observed the counterweight falling forward, top end first. He jumped clear, but the falling counterweight struck McNeill who fell backwards onto the concrete floor.

White immediately began cardiopulmonary resuscitation (CPR). Scott Hartness, Consultant, and Karen Hillard, Office Manager, were at the shop area conducting a safety audit. After being notified of the accident, they immediately went to the accident scene to provide assistance. The mine operator notified emergency medical personnel at 2:45 p.m., who arrived at the mine site about 2:56 p.m. McNeill was transported to Cape Fear Valley Medical Center and air lifted to the University of North Carolina Medical Center, Chapel Hill, North Carolina, where he died on April 12, 2012. The medical staff attributed McNeill's cause of death to blunt force trauma to the head.

INVESTIGATION OF THE ACCIDENT

MSHA received notification of the accident at 2:52 p.m. on April 11, 2012, by a telephone call from Karen Hillard, Office Manager, to the National Call Center. The Call Center notified Trincella Lewis, Secretary for the Southeast District. She informed Sam Pierce, Assistant District Manager, and an investigation started the same day. MSHA verbally issued an order under the provisions of Section 103 (j) of the Mine Act to ensure the safety of the miners. This order was later modified to a 103 (k) of the Mine Act when the first Authorized Representative arrived at the mine.

MSHA's accident investigation team traveled to the mine and conducted a physical inspection of the accident scene, interviewed employees, and reviewed conditions and procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management and employees, Harnett County Sheriff's Department, EMS Services, Cape Fear Valley Medical Center, University of North Carolina Medical Center and the Medical Examiner's Office.

DISCUSSION

Location of the Accident

The accident occurred in a shop at the mine. The shop is shared with the transportation section also owned and operated by GS Materials Inc. Mining equipment and over-the-road trucks are repaired in this shop. The shop has three large bays. The accident occurred in the third bay on the west side of the shop. The victim fell on a cement floor. No uneven surfaces or slipping conditions were present.

Equipment Involved

The excavator involved in the accident, a Caterpillar model number 349E L, is a self-propelled, hydraulically driven, crawler mounted excavator used to dig and move dirt, gravel, and clay. The excavator's boom has a 21.6 foot reach with a 4.5 yard bucket attached to the end of the boom. The operator's cab is 12 foot 3 inches from the ground level to the top of the cab. The total weight of the machine is 109,900 pounds. The weight of the counterweight is 19,840 pounds.

The excavator is equipped with a "System for the Removal of the Counterweight" to assist in removing the counterweight before transporting. Illustrations 1 and 2 depict the counterweight location at the start of this investigation. Illustration 1 shows a side profile of the excavator with the counterweight where it dropped. Illustration 2 shows a rear view of the excavator with the dropped counterweight.

Illustration 1: Side View of Excavator showing dropped counterweight

Illustration 2: Rear View of Excavator showing dropped counterweight

Inspection of the Excavator

At the time of the inspection, the excavator and the counterweight were in the same position and place as when the accident occurred. Examination of the rear frame of the excavator showed structural damage where the lift mechanism for removal of the counterweight is attached. This structural damage included bending of the excavator frame plate, cracking of paint over joints, and spaces between the counterweight lift mechanism mounting brackets and excavator frame. Further inspection revealed the hydraulic cylinder on the counterweight lift mechanism was bent. Ilustrations 3 and 4 show the damage.

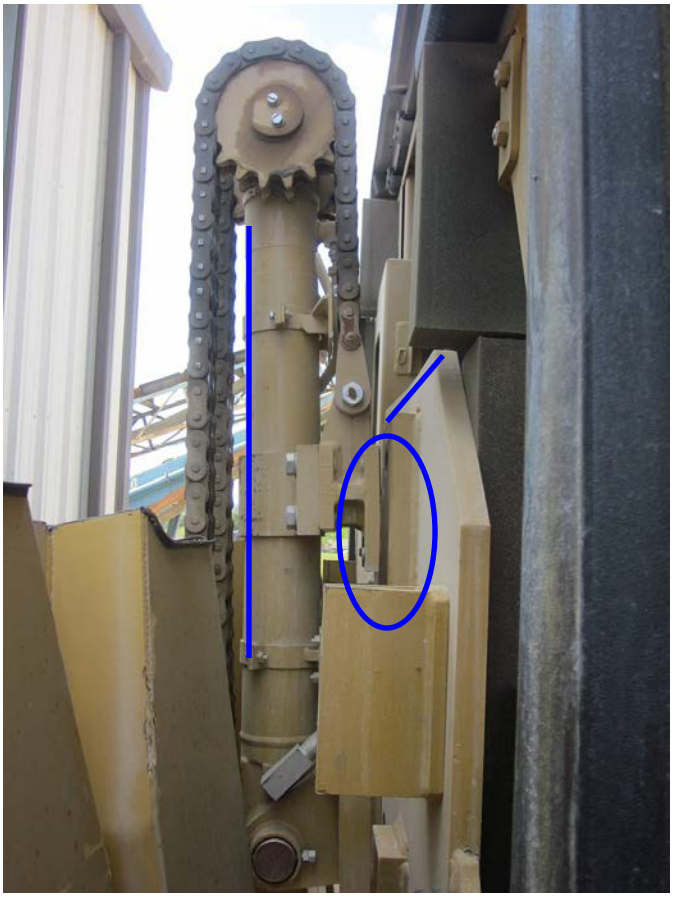


Illustration 3: Bent cylinder, frame plate, and one of the spaces between the counterweight lift mechanism mount and excavator frame.

Illustration 4: Close up of one of the spaces between the counterweight lift mechanism mount and excavator frame.

The structural damage present indicated the counterweight fell directly to the ground without being restrained by the counterweight removal system.

The “System for the Removal of the Counterweight” has dedicated controls in a side compartment of the excavator. These include two valves that enable flow to the optional hydraulic cylinder, a valve for control of cylinder movement, and an electric toggle switch to enable hydraulic operations when machine hydraulics are disabled in the operator’s compartment. See Illustration 5 for the layout of these controls. Note that these controls are not labeled.

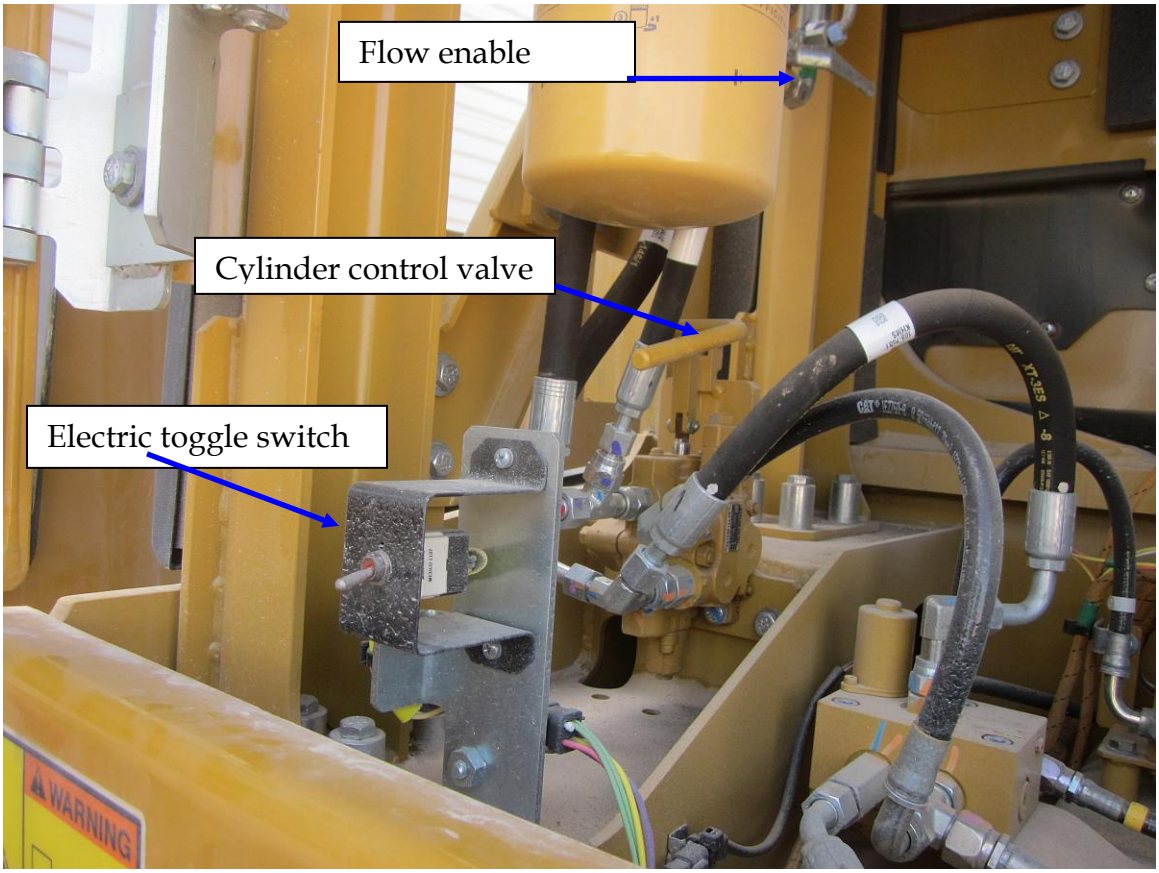


Illustration 5: Controls for the “System for the Removal of the Counterweight”

Operational Tests of the Excavator

During the investigation, the excavator was started and the counterweight cylinder extended a short distance to check for proper functioning. The controls functioned as described in the manual to lift the counterweight off the ground.

With the toggle switch turned off, the cylinder control valve did not actuate the cylinder. With the engine turned off, operation of the cylinder control valve did not affect the position of the hydraulic cylinder.

With the engine turned off and the counterweight raised in the air, the hydraulic cylinder stayed in place and maintained chain tension. This indicates the hydraulic pressure did not bleed off when the engine is off.

The visual and operational checks of the excavator did not reveal any broken or unserviceable components that could have contributed to the accident.

Discussion of the "System of for the Removal of the Counterweight"

The "System for the Removal of the Counterweight" includes both optional hardware components and a detailed removal and installation process. The designed system permits the removal and installation of the counterweight without the need of a crane, forklift, or other external heavy machinery.

The system is comprised of a hydraulic cylinder and two double strand roller chains that pass over a sprocket on the top of the cylinder. A dedicated hydraulic circuit to power the cylinder includes a bypass that allows the cylinder to operate when the machine hydraulics are otherwise disabled.

The following is a brief summary of the Caterpillar procedure to remove the counterweight of a 349E L excavator equipped with the counterweight removal system. The Operation and Maintenance Manual, media number SEBP5613, outlines the full procedure:

- Park the machine on level ground with the engine running and the hydraulics locked out in the operator's compartment.
- In the rear side compartment, enable counterweight hydraulics by flipping toggle switch and turning fluid flow enable levers.
- Use control lever to raise hydraulic cylinder to put tension on chains and remove load from bolts.
- Remove bolts.
- Use control lever to raise counterweight and expose retaining pins. This step is shown in Illustration 6 (below).
- Rotate retaining pins from horizontal to vertical.
- Use control lever to lower counterweight to the ground.

After removal of the counterweight, it can be lifted using a lifting eye on the excavator bucket and appropriate lifting gear.

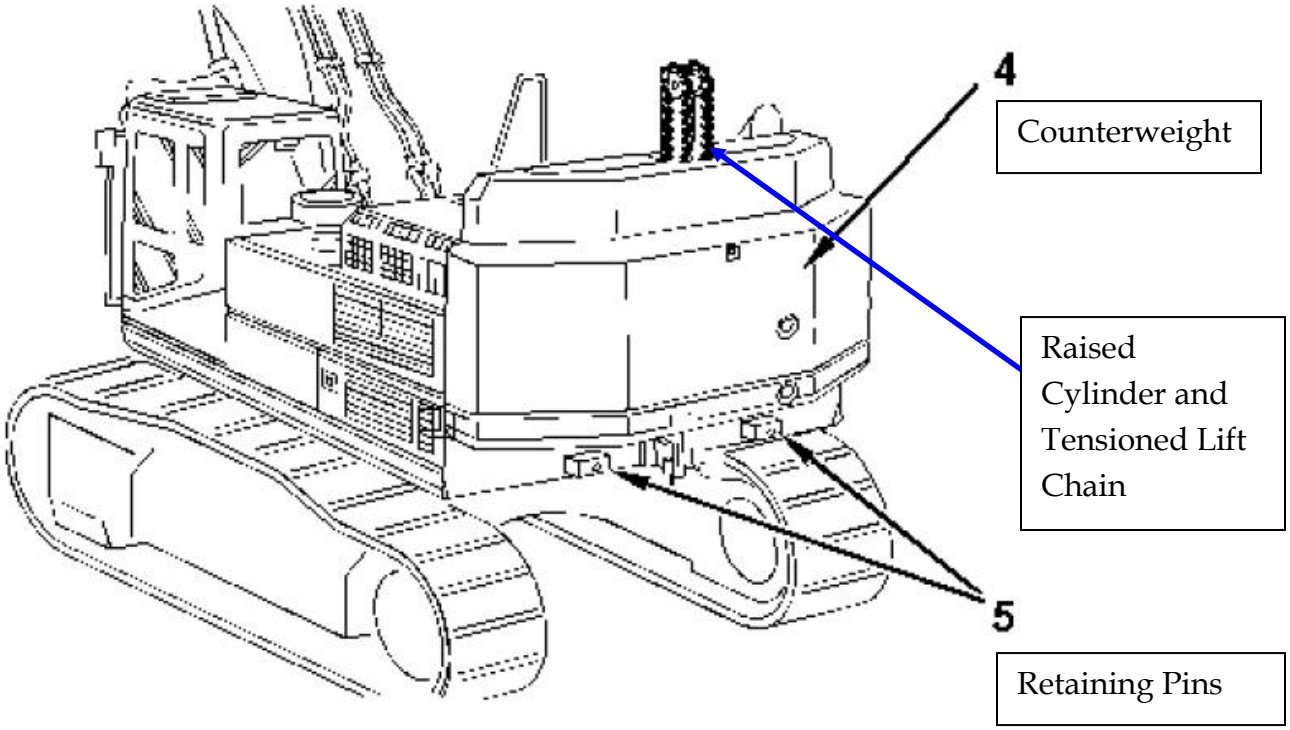


Illustration 6: Drawing of proper operation of the counterweight removal system showing the counterweight raised by tensioned lift chain to expose retaining pins. (From Caterpillar manual SEBP 5613)

Summary

1. No operational defects found on the equipment that would have contributed to the accident.
2. The structural damage present indicated the counterweight fell directly to the ground without being restrained by the counterweight removal system. There was no evidence that the hydraulic cylinder had been extended and the chain tensioned as specified in the operator's manual prior to removal of the counterweight bolts.
3. Hydraulic and electrical controls for the counterweight removal system were not labeled, either in respect to the function or the dangers of improper operation.

Weather

The weather on the day of the accident was sunny with a temperature of approximately 75 degrees Fahrenheit. Weather was not considered a contributing factor to the accident.

Training and Experience

James McNeill (victim) had been a miner for 8 years, 25 weeks, and four days, all at this location. A representative of MSHA's Educational Field Services staff conducted an in-depth review of the mine operator's training records. The training records for McNeill were examined. He had not received adequate task training prior to performing the task of removing the counterweight from the excavator. McNeill had received all of his other required training.

ROOT CAUSE ANALYSIS

Investigators conducted a root cause analysis and the following root cause was identified:

Root Cause: Management did not follow the manufacturer's procedures for removing the counterweight from the excavator. Raised components were not secured to prevent accidental lowering when persons were working on or around mobile equipment and exposed to the hazards of accidental lowering of the component. The victim did not receive task training regarding the procedures to be followed in the health and safety aspects of the new task before performing the new task.

Corrective Action: Management established procedures and controls to ensure persons can remove a counterweight from an excavator safely. The procedures include following the manufacturer's procedures when removing a counterweight. The mine operator will provide adequate task training in the health and safety aspects of the task to all miners before performing any new task.

CONCLUSION

The accident occurred due to management's failure to follow the manufacturer's procedures for removing the counterweight from the excavator. The excavator was equipped with a hydraulic system that secures and lowers the heavy counterweight to the ground safely; however, this system was not used on the day of the accident. Raised components were not secured to prevent accidental lowering when persons were working on or around mobile equipment and exposed to the hazards of accidental lowering of the component. The victim did not receive task training regarding the procedures to be followed in the health and safety aspects of the task before performing the new task.

ENFORCEMENT ACTIONS

Issued to GS Materials Inc.

Order Number 8638997 -- issued on April 11, 2012, under the provisions of Section 103(j) of the Mine Act:

An accident occurred at this operation on April 11, 2012, at approximately 2:30 p.m. As rescue and recovery work is necessary, this order is being issued, under Section 103(j) 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 in the last shop bay and around the Caterpillar 349E Excavator, #MPZ00417, except to the extent necessary to rescue an individual or to prevent or eliminate an imminent danger 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 operations and ay other person's onsite. This order was initially orally issued to the mine operator at 3:15 p.m. and has now been reduced to writing.

MSHA terminated this order on June 26, 2012, after conditions that contributed to the accident no longer existed.

Citation Number 8545463 -- issued on June 1, 2012, under the provisions of Section 104(a) of the Mine Act for a violation of 30 CFR 46.7(a):

An accident occurred at this operation on April 11, 2012. The victim was removing bolts from a counterweight on the back of an excavator when the counterweight fell and struck him. He was hospitalized and died on April 12, 2012, as a result of his injuries. The plant manager and the victim were removing a 10 ton counterweight from an excavator and failed to secure the counterweight from accidental lowering. When the victim removed the last bolt, the counterweight fell and struck him. The victim was assigned to a new task and was not provided with the health and safety aspects and safe operating procedures for the task and equipment. A representative of the excavator manufacturer provided orientation to miners on the new machine, but did not provide task training. The miners' training did not include a demonstration or any hands-on training pertaining to the installation or removal of the excavator's counterweight which weighed approximately 10 tons. The operator removed the counterweight on the excavator approximately every two weeks for transport to another mine site. Failure to provide task training on the safe work procedures to perform this dangerous task resulted in a fatal accident.

This citation is a "Rules to Live By" priority standard.

Citation Number 8545464 -- issued on June 1, 2012, under the provisions of Section 104(d)(1) of the Mine Act for a violation of 30 CFR 56.14211(c):

The victim was removing bolts from a counterweight on the back of an excavator when the counterweight fell and struck him. He was hospitalized and died on April 12, 2012, as a result of

his injuries. The plant manager and the victim were removing a 10 ton counterweight from an excavator and failed to secure the counterweight from accidental lowering. When the victim removed the last bolt, the counterweight fell and struck him. Raised components must be secured to prevent accidental lowering when persons are working on or around mobile equipment and are exposed to the hazards of accidental lowering of the component. The excavator is equipped with a hydraulic system that secures and lowers the heavy counterweight to the ground safely. The operator removes this counterweight approximately every two weeks to transport the excavator to another mine site. The foreman engaged in aggravated conduct constituting more than ordinary negligence in that he failed to assure that the hydraulic cylinder was in the raised position. When the cylinder is in the raised position, it takes the slack from the chain and secures the counterweight from accidental lowering. This violation is an unwarrantable failure to comply with a mandatory standard.

Approved: _____ Date 9/5/12

Michael A. Davis
Southeast District Manager

APPENDIX A

Persons Participating in the Investigation

GS Materials Inc.

Karen Hillard	Office Manager
Randy White	Plant Manager
Scott Hartness	Safety Consultant
Richard Batts	Mechanic

RIMKUS Consultant Group

Mark Nelson	Mechanical Engineer

Gregory Poole-Caterpillar

Robert Perkins	Trainer
Ronnie Vaughn	Safety Manager

Harnett County Sheriff's Department

CPL Scott Assmann	Deputy Sheriff
Detective Ben Rose	Crime Scene Investigator

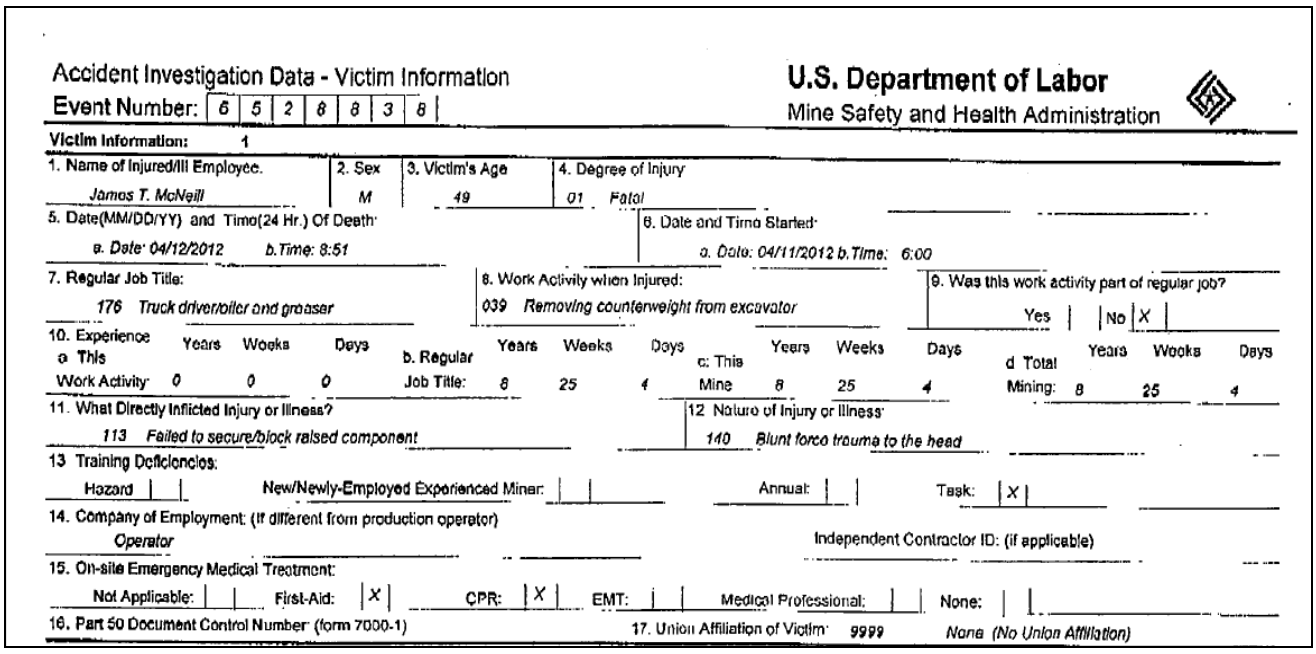
MED 1/Harnett County Ambulance Services

John Tadlock	EMT/Paramedic

Mine Safety and Health Administration

Bill Handshoe	Supervisory Mine Safety and Health Inspector
Timothy Schmidt	Mine Safety and Health Inspector
Ricky Boggs	Mine Safety and Health Specialist
Jonathan Hall	Mechanical Engineer
Phillip McCabe	Mechanical Engineer

Appendix B



Accident Investigation Data - Victim Information

Event Number: 6 5 2 8 8 3 8

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
James T. McNeill	M	49	01 Fatal

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death
a. Date: 04/12/2012 b.Time: 8:51

6. Date and Time Started
a. Date: 04/11/2012 b.Time: 6:00

7. Regular Job Title:
176 Truck driver/oiler and greaser

8. Work Activity when Injured:
039 Removing counterweight from excavator

9. Was this work activity part of regular job?
Yes | | No | X |

10. Experience

	Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days		Years	Weeks	Days
a. This Work Activity:	0	0	0	b. Regular Job Title:	8	25	4	c. This Mine	8	25	4	d. Total Mining:	8	25	4

11. What Directly Inflicted Injury or Illness?
113 Failed to secure/block raised component

12. Nature of Injury or Illness
140 Blunt force trauma to the head

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

14. Company of Employment: (if different from production operator)
Operator

Independent Contractor ID: (if applicable)

15. On-site Emergency Medical Treatment:
Not Applicable: | | First-Aid: | X | 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)