CAI-2009-7

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

Underground Coal Mine

Fatal Machinery Accident
June 9, 2009

D & C Mining Corp
D & C Mining Corp Mine
Cranks, Harlan County, Kentucky
ID No. 15-18182

Accident Investigators

Dennis Cotton
Supervisory CMI

Terrence M. Taylor P.E.
Senior Civil Engineer
Pittsburgh Technical Support

Kevin Doan
Mining Engineer

Originating Office
Mine Safety and Health Administration
District 7
Coal Mine Safety and Health
3837 South US Hwy 25E
Barbourville, KY 40906
Irvin T. Hooker, District Manager

TABLE OF CONTENTS

View of Accident Site

OVERVIEW

At approximately 7:15 p.m. on Tuesday, June 9, 2009, a fatal machinery accident occurred at the D & C Mining Corp, D & C Mining Corp Mine. The accident occurred when the chain attaching a rubber tired supply car to the S&S Model 482 scoop failed. The loaded supply car rolled downhill, through a ventilation curtain, and struck the victim. As a result, he was pinned between the supply car and a mobile bridge conveyor.

The accident occurred as a result of mine management's failure to have in place a policy to ensure supply cars were properly coupled to the tow vehicle.

GENERAL INFORMATION

The D & C Mining Corp Mine is an underground coal mine owned and operated by D & C Mining Corp. The mine is located in southeast Harlan County, Kentucky and is developed in the 36 to 60 inch Blue Gem Seam. The mine is accessed by four drift openings and employs 19 miners, working two, eight hour shifts per day, five days per week. The mine has one working section with an average production of 1,100 tons per day. Coal is extracted from the faces by a continuous miner and transported by bridge carrier and belt conveyors to the surface. Materials, supplies and miners are transported via rubber-tired battery scoops and diesel-powered, rubber-tired mantrips. The principal officers for the mine at the time of the accident were:

G. Garrison Hill .....President
Barry Rogers .....Superintendent

Prior to the accident, the Mine Safety and Health Administration (MSHA) completed the last regular safety and health inspection (E01) of the D & C Mining Corp Mine on May 28, 2009. The Non-Fatal Days Lost (NFDL) injury incidence rate for the D & C Mining Corp Mine in the first quarter of 2009 was 0.00, compared to a National NFDL rate of 4.30.

DESCRIPTION OF ACCIDENT

The second shift crew, led by Wilson Rome Meade (victim), Section Foreman, began work as usual at 4:00 p.m. on the day of the accident. Meade and Kentucky Office of Mine Safety and Licensing (OMSL) Safety Analyst, Jim Skidmore, boarded a battery powered buggy and traveled the belt conveyor entry, with Skidmore observing the pre-shift examination of the conveyor belts and drive units made by the previous shift. The second shift crew, consisting of James Arthur Engle, Miner Operator; Mark Anthony Goins, Roof Bolter/Bridge Carrier Operator; Mark Hayes Cain, Roof Bolter Operator, Mine Emergency

Technician (MET); Thurman Jerome Anderson, Bridge Carrier Operator; Chad Green, Bridge Carrier Operator/Roof Bolter Operator; and Garrett Patrick Grubbs, Beltman, MET, boarded a diesel Mac 8 mantrip and entered the mine, traveling via the intake roadway to the 001 Section. Grubbs got off the mantrip at the section belthead and the remainder of the crew proceeded to the section. Jeffrey Lee Bruce, Scoop Operator, followed in the S & S 482 scoop with a load of rock dust in the bucket of the scoop.

The mine had no maintenance shift and work on the section began with servicing the equipment. Before the service work was complete, Meade and Skidmore arrived on the section. Mining was started and progressed normally until the continuous mining machine began mining in the 2 Left Crosscut. This was to be the final place mined before a belt conveyor move was to be performed. In preparation for the belt conveyor move, Bruce cleaned the crosscut connecting the Number 2 and 3 Entries with the scoop. After additional belt was added during the belt conveyor move, an intake stopping could be constructed at this location. Bruce told Meade he was going to place a load of concrete block in the crosscut for construction of the stopping. Meade told him to "go ahead."

Bruce hooked the steel tongue of the rubber-tired supply car to a hole in the center of the bucket of the S & S 482 scoop by lining up the hole in the tongue with the hole in the bucket and looping a 1/4 inch chain through both. Bruce pulled the supply car loaded with block up the roadway and turned into the crosscut between the Number 1 and 2 Entries, lining up the supply car with the crosscut where the stopping was to be constructed. Bruce stated that the car "jerked real hard," and broke away from the scoop. The loaded supply car rolled down grade, through the crosscut between Number 2 and 3 Entries, towards the Number 3 Entry. Meade was shoveling the belt conveyor tailpiece in the Number 3 Entry when the supply car continued through a ventilation curtain, striking and pinning him against the outby Jeffrey 94L bridge conveyor.

Anderson, operator of the outby Jeffrey 506 bridge carrier, felt something slam into his bridge. Anderson looked back and saw Meade pinned between the supply car and the bridge. Anderson actuated the panic bar on his bridge carrier and shut off the machine's power. Meade yelled "Back up! Back up!" Anderson re-energized the machine and moved the bridge carrier to free Meade. When freed, Meade fell to the mine floor and remained unresponsive.

Cain, MET, was roof bolting in the neck of the 1 Left Room, when he heard Anderson yell for help. He went to the accident scene and sent Goins for first aid supplies. Cain began treatment of Meade by opening his airway and checking for a pulse. Grubbs, MET, was at the section belthead and heard the telephone page. He answered the telephone, was told there had been an accident and he

was needed on the section. He boarded his battery mantrip and traveled up the belt entry to the section, arriving in a very short time. Cain and Grubbs extricated Meade from beneath the bridge and began further treatment.

Engle, Bruce and Anderson blocked the supply car against further movement. They attached a small belt hanger chain to the car and attempted to pull it out of the way. The supply car moved only a short distance when the chain broke. Engle and Anderson obtained a larger chain, attached it to the supply car and pulled it to the crosscut between the Number 1 and 2 Entries to make room for the diesel mantrip to transport Meade.

Goins arrived with the first aid supplies and Meade was secured to a back board stretcher for transport. Meade was loaded aboard the diesel mantrip and transported to the surface with Cain and Grubbs continuing treatment. Near the surface, they could no longer detect a pulse or respirations and began CPR.

When the mantrip arrived on the surface, Homer Ealy, Outside Person and MET, was on site and began assisting with CPR. The Life Care ambulance arrived a few minutes later and the ambulance attendants, along with Ealy, took over the CPR and treatment of Meade. He was transported to the Harlan Appalachian Regional Hospital and pronounced dead by Harlan County Coroner, Philip Bianchi, at 8:22 p.m.

INVESTIGATION OF THE ACCIDENT

On Tuesday, June 9, 2009, at approximately 7:38 p.m. MSHA was notified by the National Call Center that a potentially fatal accident had occurred at the D & C Mining Corp, D & C Mining Corp mine. Dennis Cotton, MSHA Supervisor, received the call and contacted Bob Rhea, MSHA Supervisor in the Harlan Field Office. Rhea dispatched Kevin Doan, MSHA Accident Investigator, to the mine. Upon his arrival on site, Doan issued a 103(k) Order at 8:43 p.m.

The accident investigation was conducted in cooperation with the Kentucky OMSL, along with assistance from the mine operator and employees. A list of persons participating in or present during the investigation are included in Appendix A.

Representatives of MSHA, OMSL, and the operator traveled underground to the accident site to examine the scene and begin an investigation of existing physical conditions. Digital photographs and relevant measurements were taken. A series of measurements were taken along the travel path of the car in order to produce a sketch of the scene.

On Wednesday, June 10, 2009, MSHA investigators conducted a survey of the area to determine the grade along the path of travel of the supply car. An MSHA electrical specialist examined the S & S Model 488 scoop for defects that could have contributed to the accident. A representative of MSHA's Educational Field Services reviewed the training records and a representative of MSHA's Pittsburgh Technical Support office provided assistance with evaluation of the equipment involved in the accident.

Interviews were conducted with seven persons on June 10, 2009 at the OMSL, Harlan, KY District Office.

DISCUSSION

The supply car involved in the accident was manufactured by the Frank Kersey Corporation of Bluefield, Virginia. The legible portion of the model number on the supply car data plate is 6514, with a serial number of 68194. This supply car was taken to the company's truck scales and weighed. An empty weight of 3,280 pounds was determined. The investigation revealed that when the accident occurred, the supply car was loaded with 228 concrete blocks, as well as a few wooden wedges and wooden cap blocks.

The vendor for the chain used to hook the supply car to the scoop provided a specification sheet for the chain.

Tow Force of the Loaded Trailer

The towing resistance of the trailer is a combination of the weight of the loaded trailer, the ground condition, and the slope. It was determined this batch of concrete blocks had an average weight of 29 pounds each. Considering the weight of the wedges and cap blocks as insignificant, the total weight of the supply car and block was 9,892 pounds or 4.95 tons. The ground was relatively smooth, dry, without ruts in the area of the accident, and the mine floor was sloping at a surveyed grade of 7.36%. With the trailer being pulled upslope the towing force was calculated to be between 1,045 pounds and 1,223 pounds.

The wheels of the supply car may slide partly sideways, rather than roll, due to exceeding the turning radius of the trailer, resulting in an increase of the towing force. This increased tow force was calculated to be between 4,688 pounds and 6,169 pounds, depending on the towing resistance of the trailer while rolling or sliding.

Chain Capacity

The chain had ¼-inch-diameter links that were 1-3/4 inches long. The chain was Grade 30 carbon steel. The specification sheet for the chain indicates that the chain had a working load of 1,517 pounds and a breaking strength of 5,440 pounds.

Rigging

Based on witness testimony provided to the investigators, the eye of the tow bar and the hole on the scoop were aligned. The chain was fed through the hole once, then wrapped around and fed through the hole a second time. The grab hook was then attached back onto the chain, essentially forming two relatively tight loops. The chain was used similar to the way a pin would be used. This type of arrangement would have placed the chain links in tension, shear, and bending. Any slack in the system would have placed two legs of the chain in tension. If the chain was able to freely slide around the eye of the pull bar and provide equal tension in each leg, then the breaking capacity of the chain rigging would be doubled, or 10,880 pounds. Since the eye on the pull bar, the hole in the bucket of the scoop and the edge of the scoop represented a hard corner for the chain to bend about; a typical reduction in the chain capacity of 50 percent is warranted. The strength reduction is applied, because in addition to the tension caused by the pull of the load, the chain is also being stressed in bending and shears from the corners. Therefore, the breaking load capacity would be approximately 5,440 pounds.

Based on the thickness of the bucket edge and/or the thickness of the tow bar, the links likely grab or bind between adjacent links onto the corners of the eyes as they wrap over the respective openings and edge of bucket. This would then allow one leg of the chain to take more load, while the other is relatively slack, as the chain would not freely slide through the eyes on the tow bar and/or bucket. In this case, the chain capacity would be the same as a single leg straight pull, which is 5,440 pounds, less the 50 percent reduction due to the hard corner, which would give the chain a net capacity of only 2,720 pounds.

Comparison of Chain Breaking Strength as Rigged with the Tow Force

The chain was rated with sufficient strength to tow the rolling trailer when it was aligned with the scoop, since both 2,720 (single leg) and 5,440 pounds (double leg) capacity are greater than tow forces of 1,045 and 1,223 pounds. An exception would be if the wheels caught on a significant rock or rut, or there was a sudden

shock-type loading. Further, when the loaded trailer was not in direct alignment with the rear of the scoop as it came around the corner of the pillar, there would have been a side loading component on the tow bar, which would have a tendency to place additional loads on the chain wrapping, creating an additional pry on the chain and rubbing on the edge of the scoop bucket. A misalignment of 20 degrees would create additional tensile forces and shears large enough to exceed the chain capacity.

The chain did not have sufficient strength to tow the trailer when it was sliding partly sideways, rather than rolling, either due to turning radius or an impingement by the mine rib as the trailer was turning the corner. The sliding load would have been between 4,688 pounds and 6,169 pounds (as indicated above). If the chain was not free to slide over the eyes or corners of the eyes, it would essentially be grabbed by the eye or edge of bucket and therefore could fail one of the legs with a load capacity of only 2,720 pounds, so it would be expected to fail if the trailer was temporarily being dragged. Even if both legs were sharing the loading equally, its capacity would only be 5,440 pounds due to the hard corner effect. This capacity is less than the sliding load and it would be expected to break.

Failed Chains

The chain had failed links that were twisted and bent, which is consistent with being pulled around a hard corner. The chain had several shinny rub marks and nicks, indicating new abrasions. It had two broken links and was in three sections, with one of the sections having a grab hook fastened to its end. The three sections had a combined length of three feet. The abrasions were consistent with the chain being pulled over and rubbed by the hard corners of the eyes on the tow bar and the scoop bucket. In addition, there was a significant gouge and deformation to one of the links, which was likely the spot where the grab hook had attached onto the chain. One of the failed links had fractured in two locations and the other had fractured in one location, which corresponded with the weld on the side of the link.

Summary

With respect to the working load limit of the chain of 1,517 pounds in a straight pull or 3,034 pounds in a basket-type rigging arrangement, the chain was being used beyond the design capacity when the load was rolling, as the hard corner effect would require a 50% reduction in capacity.

Calculations indicate that the chain failed because it was improperly used by wrapping over hard corners on both the pull bar and the scoop bucket and from

the loads created by the trailer either sliding or being misaligned as it was rolling.

TRAINING

The company's training records were examined by representatives of MSHA's Educational Field Services. No training deficiencies for Meade were noted. All training records were examined and deficiencies were found for other company employees. These were determined to be non-contributory to the accident and were cited separately.

ROOT CAUSE ANALYSIS

An analysis was conducted to identify the most basic cause of the accident that was correctable through reasonable management controls. During the analysis, a root cause was identified that, if eliminated, would have either prevented the accident or mitigated its consequence. Listed below is the root cause identified during the analysis and the respective corrective action implemented to prevent a recurrence of the accident:

Root Cause: Mine management failed to have in place a policy to ensure supply cars were properly coupled to the tow vehicle.

Corrective Action: The operator has developed and implemented a written procedure for the proper attachment of cars and/or trailers to tow vehicles. Scoops will be equipped with a properly sized clevis to accept the tongue. Supply cars will be attached to the scoops with no less than a 4 inch wide, by 16 inch long, by 1 inch thick tow bar coupled with a 1 ¼ inch diameter pin with a lock. Additionally, a 3/8 inch high strength safety chain will also be maintained between the scoop and the supply car. Any trailer towed by the mantrip buggy will be coupled with no less than a 5/8 inch diameter pin with lock and further secured by a ¼ inch high strength safety chain. The maximum gross vehicle weight of the towed vehicle will be 10,000 lbs. for the scoop and 5,000 lbs. for the buggy.

The operator has trained the miners in this new procedure.

CONCLUSION

The accident occurred as a result of mine management's failure to have in place a policy to ensure supply cars were properly coupled to the tow vehicle.

Approved By:

Irvin T. Hooker
District Manager, District 7

10/20/2009
Date

ENFORCEMENT ACTIONS

A 103(k) Order, No. 7489388, was issued to ensure the safety of the miners until the accident investigation could be completed.

A Safeguard Notice, No. 8400802, was issued under section 314(b) of the Mine Act, requiring the operator to establish and implement a written procedure for the proper coupling of supply cars to tow vehicles:

The Kersey rubber tired supply car, serial number 68194, was attached to the tow vehicle, an S&S Model 482 scoop, with a ¼ inch diameter chain. The failure of this chain resulted in a fatal accident on June 9, 2009. This is a notice to provide safeguard requiring the supply car to be attached to the scoops with no less than a 4 inch wide, by 16 inch long, by 1 inch thick tow bar coupled with an 1 ¼ inch diameter pin with a lock. Additionally, a 3/8 inch high strength safety chain will also be maintained between the scoop and the supply car. Any trailer towed by the mantrip buggy will be coupled with no less than a 5/8 inch diameter pin with a lock and further secured by a ¼ inch high strength safety chain. The maximum gross vehicle weight of the towed vehicle will be 10,000 lbs. for the scoop and 5,000 lbs. for the mantrip buggy.

Appendix A
List of Persons Participating in the Investigation

Mining Company Officials

Barry Rogers ..... Superintendent
Wendill Middleton ..... Section Foreman
Homer Ealy ..... Outside Man

Kentucky Office of Mine Safety and Licensing

George Johnson ..... Supervisor, Harlan District
Tracy Stumbo ..... Chief Accident Investigator
Greg Goins ..... Deputy Chief Accident Investigator
Tim Fugate ..... Accident Investigator

Mine Safety and Health Administration

Tommy Hooker ..... District Manager
Jim Langley ..... Assistant District Manager
Dennis Cotton ..... Supervisor
Bob Rhea ..... Supervisor
Kevin Doan ..... Accident Investigator
Craig Clark ..... Coal Mine Inspector
Jack Harris ..... Coal Mine Inspector
Lantre Combs ..... Accident Investigator
Sean Davenport ..... Electrical Specialist
Debbie Combs ..... EFS Specialist
Terrence M. Taylor P.E. ..... Senior Civil Engineer

Appendix B
Victim Information

Accident Investigation Data - Victim Information
Event Number: 4 4 6 8 8 0 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. Degree of Injury:
Wilson R. Meade	*M*	*58*	*01 Fatal*

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death: *a. Date: 06/09/2009 b.Time: 20:22*

6. Date and Time Started: *a. Date: 06/09/2009 b.Time: 16:00*

7. Regular Job Title: *049 Supervisory/management/foreman/boss*

8. Work Activity when Injured: *025 Hand load; hand shoveling/mucking*

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

10. Experience

	Years	Weeks	Days
a. This Work Activity:	*40*	*0*	*0*
b. Regular Job Title:	*29*	*0*	*0*
c: This Mine:	*5*	*0*	*0*
d. Total Mining:	*40*	*0*	*0*

11. What Directly Inflicted Injury or Illness? *109 Nonpowered vehicles*

12. Nature of Injury or Illness: *170 Crushing*

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

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: X | None:

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

17. Union Affiliation of Victim: *9999 None (No Union Affiliation)*

Victim Information:

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Degree of Injury:

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death:

6. Date and Time Started:

7. Regular Job Title:

8. Work Activity when Injured:

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

10. Experience:

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

11. What Directly Inflicted Injury or Illness?

12. Nature of Injury or Illness:

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

14. Company of Employment: (If different from production operator)
Independent Contractor ID: (if applicable)

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

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

17. Union Affiliation of Victim:

Victim Information:

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Degree of Injury:

5. Date(MM/DD/YY) and Time(24 Hr.) Of Death:

6. Date and Time Started:

7. Regular Job Title:

8. Work Activity when Injured:

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

10. Experience:

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

11. What Directly Inflicted Injury or Illness?

12. Nature of Injury or Illness:

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

14. Company of Employment: (If different from production operator)
Independent Contractor ID: (if applicable)

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

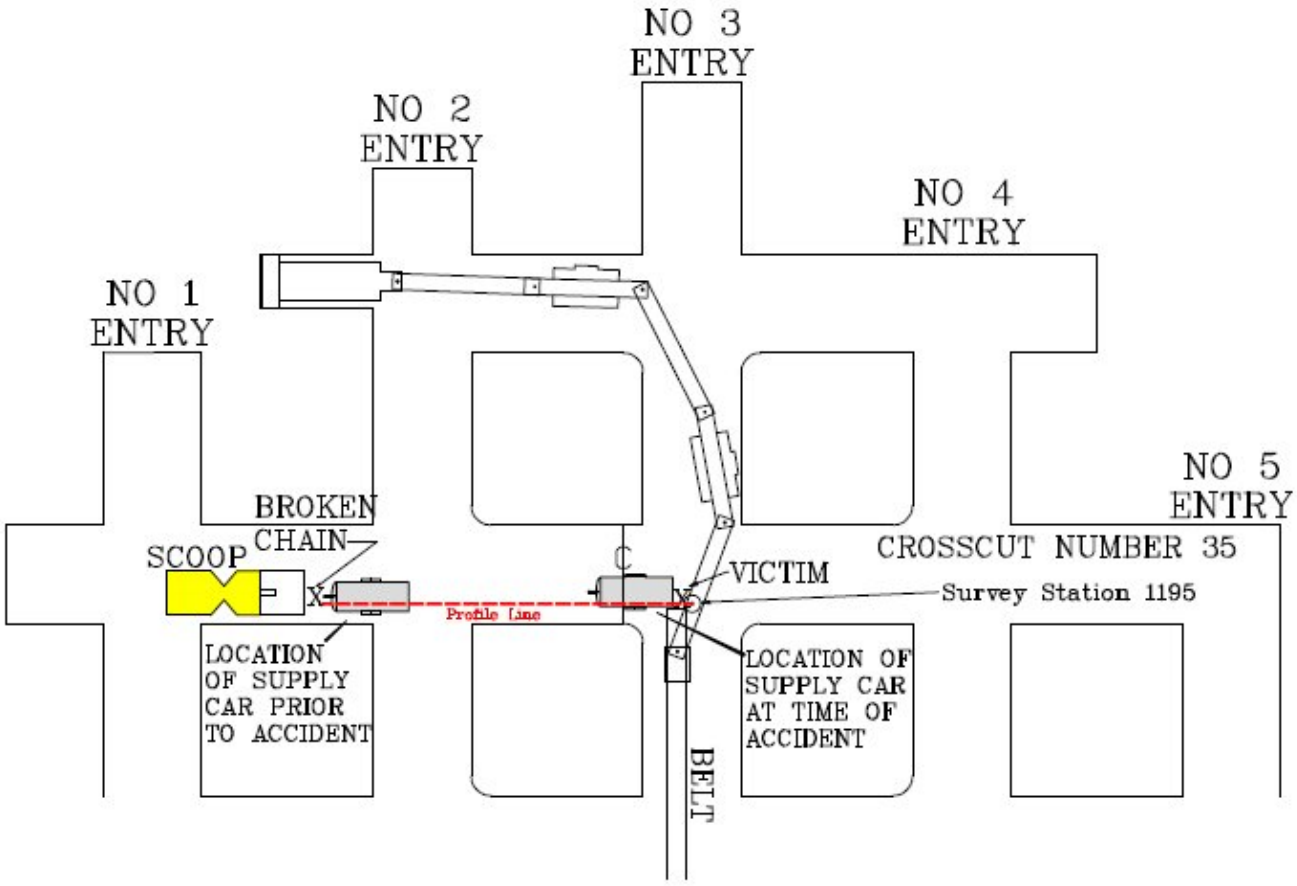
16. Part 50 Document Control Number: (form 7000-1)

17. Union Affiliation of Victim:

EXHIBIT 1
PHOTO OF SUPPLY CAR WITH CONCRETE BLOCK

EXHIBIT 2
DRAWING OF ACCIDENT SITE

D & C Mining Corporation
Accident Location
Map and Profile



Profile Line