CAI-2003-09

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION
UNDERGROUND COAL MINE

FATAL ELECTRICAL ACCIDENT
January 21, 2003

Classic Company (6BH)
Castlewood, Virginia

at

Dorchester Enterprises, Inc.
Mine No. 4
Appalachia, Wise County, Virginia
I.D. No. 44-07052

Accident Investigator

Russell A. Dresch
Electrical Engineer

Originating Office
Mine Safety and Health Administration
District 5
P.O. Box 560, Wise County Plaza, Norton, Virginia 24273
Edward R. Morgan, District Manager

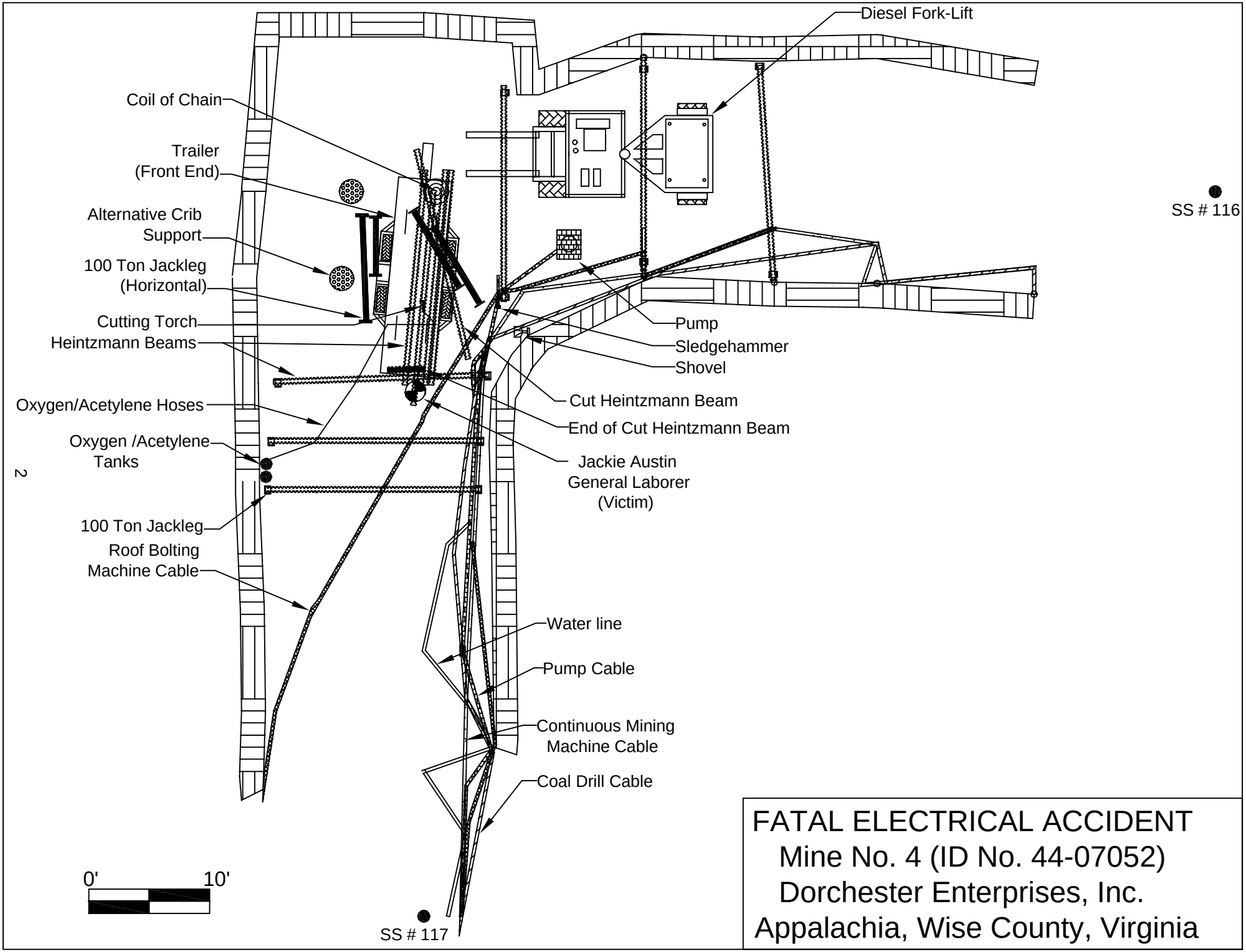
RELEASE DATE: April 30, 2003

TABLE OF CONTENT

OVERVIEW

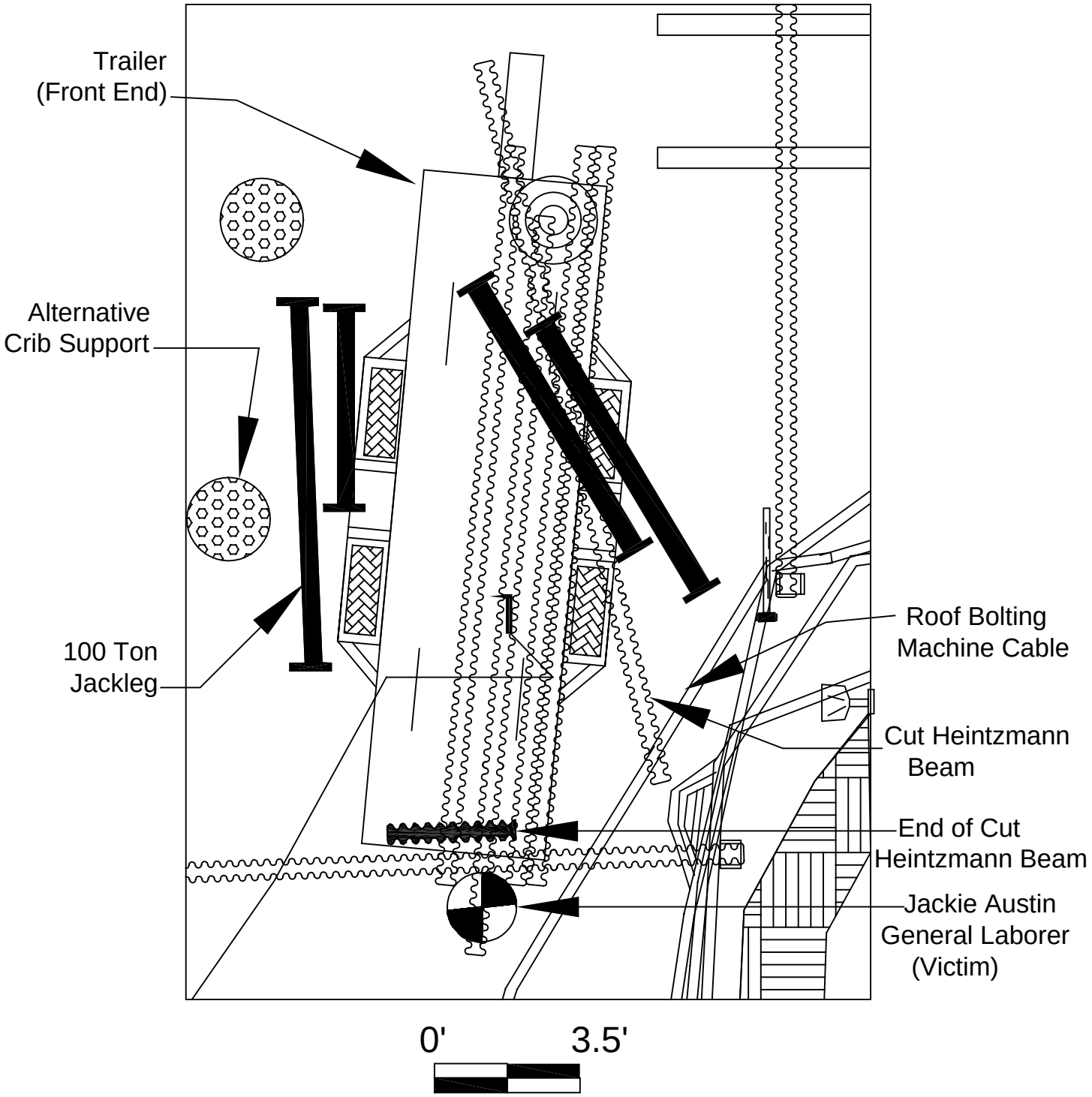
On Tuesday, January 21, 2003, at approximately 1:55 p.m., Jackie Austin, age 33, a general laborer for Classic Company, an independent contracting company, was fatally injured at Dorchester Enterprises, Inc., Mine No. 4. The victim was electrocuted when he touched an energized metal trailer or the structural steel beams on it. He was assisting with the installation of steel beams and jacks as supplemental roof support. Another laborer had just cut a beam with a torch and laid one end on the mine floor while the other end leaned against metal jacks in the trailer. The victim was in the process of placing the cut off end of the beam onto the rear of the trailer. He collapsed and was subsequently pronounced dead.

The energized power cable for the #1 Roof-Bolting Machine was routed close to the trailer and the area where the beam was cut. This beam became energized as well as the trailer and the jacks and beams on the trailer. When the victim touched the energized trailer, or beams on it, he completed the electrical circuit by providing a path to ground and was electrocuted.



FATAL ELECTRICAL ACCIDENT
Mine No. 4 (ID No. 44-07052)
Dorchester Enterprises, Inc.
Appalachia, Wise County, Virginia

FATAL ELECTRICAL ACCIDENT
Mine No. 4 (ID No. 44-07052)
Dorchester Enterprises, Inc.
Appalachia, Wise County, Virginia



GENERAL INFORMATION

Dorchester Enterprises, Inc.; Mine No. 4; I.D. No. 44-07052 is located on State Route 78 near Appalachia in Wise County, Virginia. Mining began August 30, 2002. The mine has four drift openings into the Imboden coal seam. The only active section is located approximately 1850 feet from the surface. The mining height averages six feet. The last air sample collected showed no methane liberation. Immediate mine roof typically consists of 0 to 10 feet of shale with sandstone as the main roof.

Thirty-one underground miners and four surface personnel are employed at this mine. The mine operates with three nine-hour shifts, five days per week. Coal is produced on the continuous mining section (001-0 MMU) on the day and midnight shifts. Maintenance and utility work is performed on the afternoon shift. At the time of the accident the 001-0 MMU Section was advance mining. The mine produces an average of 400 tons per day.

A room-and-pillar system of mining is utilized at this mine. Coal is produced using a remotely controlled continuous mining machine. Coal is hauled by shuttle cars from the face areas to the belt conveyor system for transport to the surface. Trucks are employed to haul the raw product from the mine. Two roof-bolting machines are used to secure the exposed strata. Employees and supplies are transported to the section via either battery or diesel-powered, rubber tire equipment.

Classic Company was contracted to work at this mine. This contractor performs general labor for the mining company. At the time of the accident five contract workers were underground installing supplemental roof supports.

The Mine Safety and Health Administration (MSHA) completed the last health and safety inspection of the mine on December 31, 2002. The NFDL (non-fatal days lost) national injury frequency rate from the 4th quarter of 2002 for underground mines is 6.54. The NFDL frequency rate from the 4th quarter of 2002 for this mine and for Classic Company is 0.

DESCRIPTION OF THE ACCIDENT

On January 21, 2003, up to the time of the accident about 1:55 p. m., personnel from the coal company produced coal. Bobby Wise, Jr. was operating the continuous mining machine in the No. 5 Entry. David Aistrop, Jr., Shuttle Car Operator, was at the conveyor belt feeder along with Sam Stallard, Section Repairman. Michael Bowman, Section Foreman, was located in the Number 3 Entry, making notes and diagramming the day's progress.

The contractor employees from Classic Company were in the crosscut between the No. 4 and 5 Entry near spad 120. They were installing supplemental roof support consisting of steel beams and jacks. The beams and jacks were transported to this area by a rubber tire, metal trailer that was moved with a diesel forklift. The 18-foot beams were cut with an oxygen-acetylene torch to fit the width of the crosscut.

Gail Kiser, Superintendent for another company owned mine, was at this mine assisting with the newly opened operation. He and John Stewart, Contractor-Supervisor, were taking measurements to set a jack in the middle of the No. 5 Entry, near the left, front corner of the trailer.

Jackie Austin (victim), Jason Johnson, John Osborne and Sam Sanders, General Laborers for Classic Company, were removing a beam from the trailer. Osborne was operating the forklift while the others assisted. Osborne used the forklift to pick up one end of the beam. The other men picked up the other end of the beam and placed it on the mine floor near the back of the trailer. The beam was positioned with one end on the mine floor and the other end leaning against the metal objects in the trailer.

Once the beam was positioned, Johnson stood between the trailer and the forklift. Sanders was cleaning the mud away from the #4 Heading pump located in the Number 5 Entry, outby the intersection.

After parking the forklift, Osborne proceeded to cut the beam for installation. He positioned himself on the right side of the trailer behind the tires. He raised the end of the beam that was on the mine floor and secured it by pinching the beam between his knee and the trailer. Austin was holding the short section of the beam that would be discarded.

Upon completion of the cut Osborne turned off the oxygen-acetylene torch and set it down. He then wrapped his arm around the beam and lowered the end to the mine floor. The other end of the beam remained against the objects on the trailer. Osborne walked to the front end of the trailer and asked for assistance to move the beam into place.

Meanwhile, Austin had the discarded piece of beam, which was approximately 3 feet long and weighed 50 pounds. He carried the piece to the back end of the trailer.

Johnson responded to the request for assistance by walking to the front end of the trailer and reaching for the end of the beam that was leaning against the objects on the trailer. On contact he felt a mild electrical shock and drew back his hand.

Austin voiced sounds of distress and cried out. This alerted Osborne to turn around. Osborne saw Austin at the back end of the trailer. Austin was pivoting to the right as he collapsed. He landed with his stomach on top of several beams that were protruding from the trailer.

Osborne went to Austin and grabbed him to roll him off the beams. Osborne felt a substantial electrical shock. He quickly drew back his arm, stepped back and turned. He said, "Boys, he's getting electrocuted." Osborne then returned to Austin and on contact again felt a substantial electrical shock. He again pulled away and turned to see where everybody was located.

Kiser and Stewart heard someone yell. They ran past the front of the trailer, down the right side of it where the beam was cut and over to where Austin was lying. Kiser had reached Austin and was attempting to roll him over. Stewart assisted Kiser; neither felt an electrical shock. With Osborne's help the three rolled Austin off the beams and onto his back. The third time Osborne touched Austin he felt a slight electrical shock.

With Austin on his back, Stewart assessed his condition. Kiser summoned Wise (who is certified in Advanced First Aid) and the two Emergency Medical Technician – First Responders; Aistrop and M. Bowman. Kiser then told Stallard to call outside for an ambulance. Aistrop arrived at the scene. He and Stewart started cardiopulmonary resuscitation (CPR). Aistrop executed the chest compressions while Stewart began mouth-to-mouth. M. Bowman relieved Aistrop when he arrived at the scene. Stallard called Frank Bowman, Superintendent, on the surface at about 1:58 p. m. After Stallard made the phone call he brought the diesel mantrip to the scene. Aistrop and Wise went to the power center to get the First Aid Kit. They removed the stretcher from the First Aid Kit and used it to transport Austin to the diesel mantrip. CPR was continued during the ride to the surface. Upon reaching the surface, the Appalachia Rescue Squad took over care of the patient and delivered him to Wellmont Lonesome Pine Hospital. The emergency room physician, Dr. Kenneth Slater, pronounced him dead at 2:51 p. m., on January 21, 2003.

INVESTIGATION OF THE ACCIDENT

At about 1:59 p. m., F. Bowman called Larry Coeburn, Acting MSHA Assistant District Manager, to inform the agency of the accident. Information concerning the injury was gathered and an accident investigation team was assembled. All team members came from the MSHA office located in Norton, Virginia. The initial team consisted of Russell A. Dresch, Electrical Engineer, Arnold D. Carico, Mining Engineer, and Larry Meade, Jr., Coal Mine Safety and Health Inspector. Dresch acted as team leader and photographer. Carico was assistant team leader.

The team arrived at the mine around 4:00 p. m. A 103(k) Order was issued to ensure the health and safety of persons in the affected areas of the mine until the investigation could be completed. Officials from Dorchester Enterprises, Inc.; Classic Company; Virginia Department of Mines, Minerals, and Energy; and MSHA arranged a joint investigation at the mine. The investigation team made a preliminary examination of the accident scene and photographs were produced. Cables that were routed in the immediate vicinity of the scene were tested for anomalies.

On January 22, 2003, at about 6:45 a. m., the investigation resumed at the mine site. Benjamin S. Harding, MSHA, CMI Supervisor was added to the team. The circuit breakers and ground check monitoring devices on the Section Power Center and distribution box were examined and tested for abnormalities. On this day, all of the cables were tested for damage. The scene of the accident was inspected and a scale drawing was developed. After measurements were taken, the cables around the scene were closely inspected. A damaged area was found on #1 Roof-Bolting Machine cable. The cable was then energized and tested for stray voltage under controlled conditions. A section of this cable that included the damaged area was obtained for examination and testing.

The investigation ended on February 5, 2003, after the mine was visited for the third time. Follow-up information was gathered concerning the type and manufacturer of the equipment involved with the accident and additional measurements were taken.

Interviews of ten people (Appendix A) were conducted on January 22, 2003. One follow-up interview was conducted on February 5, 2003.

The MSHA Approval and Certification Center (A&CC), located in Triadelphia, West Virginia, examined and tested a section of damaged cable from the #1 Roof-Bolting Machine. The examinations and tests were conducted on April 4, and April 24, 2003.

A spot inspection (CAA) was conducted concurrently with the investigation to address any enforcement issues not related to the accident.

DISCUSSION

SECTION POWER CENTER

1. The 1200 Kilovolt Ampere (KVA) Section Power Center provides 995 Volt Alternating Current (VAC) to the continuous mining machine and 480 VAC to all other section equipment including the #1 Roof-Bolting Machine. No deficiencies were found with the safety devices on the power center. All of the circuit breakers and ground check monitors operated properly.

2. One circuit breaker on the power center provides power to a distribution box. The distribution box provides power to three pump circuits. The circuit breakers and ground check monitors for these circuits operated properly.

3. No circuit breakers were electrically tripped (de-energized) due to the accident.

4. The #1 Roof-Bolting Machine circuit breaker operated properly when tested. During the test, a solid electrical connection was placed from one phase lead to ground. Once the breaker was energized its protective devices sensed the ground fault condition and tripped the breaker. All three phases were tested in a similar fashion.

TRAILING CABLES

5. All the cables providing power to the mining equipment on the section were checked for a grounded phase or phase to phase condition with a multimeter. None were found. All the cable couplers were properly grounded.

6. The #1 Roof-Bolting Machine was in the Number 4 Entry. A number 2 American Wire Gauge (AWG), 2 Kilovolt (KV), round cable provides 480 VAC power to the machine. The cable was routed through the crosscut between Number 4 and 5 Headings and down Number 5 Heading to the Section Power Center. The cable was routed in close proximity to the right rear corner of the trailer and the beam that was cut.

ACCIDENT SCENE

7. The metal trailer is approximately 4.5 feet wide by 16.25 feet long, 18 inches off the ground, with two side rails about 12 inches high. The trailer held several jacks and beams.

8. The steel beams on the trailer are 18 feet long and weigh approximately 300 pounds.

9. The beam that was cut with a torch was found with the cut end on the mine floor and the other end leaning on metal jacks located on the trailer. The cut end of the beam has a jagged edge resulting from the cutting process. The cut end was hot when placed on the mine floor.

10. The #1 Roof-Bolting Machine cable was found under the beam about 6 inches from where the beam touched the mine floor. A small damaged area was found in the cable in close proximity to the beam. The outer jacket of the cable had a rupture like a notch. Within the

cable the red insulation on a current carrying conductor had a burnt area smaller than the size of a dime. When cut open, the inside of the cable appeared clean without signs of water, mud, coal or other debris.

11. David Creamer; Chemist, Materials and Explosion Testing Branch, from A&CC examined and tested the damaged area of the cable from the #1 Roof-Bolting Machine. He described the damaged area as a triangular notch with no other damage other than normal wear. No flattening of the cable's outer jacket was observed. He performed a heat exposure experiment on a sample of the red insulation which produced a discoloration. Although a similar discoloration was observed around the damaged area, a correlation was not concluded.

12. The damaged area on the #1 Roof-Bolting Machine cable was the only source of electricity found that could have energized the trailer.

13. The mining height where the accident occurred measured 7 feet with an entry width of 19.5 feet.

14. The mine environment was wet. At the time of the accident water was flowing toward the front of the trailer. The front of the trailer was in a low area where water accumulated to a depth of approximately 8 inches. About 2 inches of water collected at the back of the trailer. At the location where the beam was cut there was approximately 4 inches of water.

15. The top of the #1 Roof-Bolting Machine cable was barely visible in the area where the beam was cut, due to the water level.

16. There was little clearance between the trailer and the corner of the coal rib. Installed jacks, cables, waterline, and a rock limited the walkway along the rib. The trailer had 2 jacks protruding from its right side that were an obstruction to this walkway. The cut end of the beam was placed across the walkway. In order to walk through this area without jumping over the beam, a person would need to step over the beam close to where it touched the mine floor. It was in this area that the #1 Roof-Bolting Machine cable was routed along the mine floor.

EVENTS

17. Workers touched the trailer several times without receiving any electrical shock before the beam was cut. Austin, Johnson, and Sanders touched the trailer when they removed the beam. Osborne and Austin held the beam (that was touching the trailer) while Osborne cut it with a torch. Osborne placed his end of the beam on the mine floor. He also had contact with the trailer when he placed the torch on it.

18. Austin carried the cut off piece of beam to set it in the back of the trailer. The piece was found on the back end of the trailer. He apparently came in contact with the trailer or the beams on the trailer at this time.

19. Osborne stated he saw Austin before he landed across the protruding beam on the trailer. Austin was standing, not leaning forward, at the back of the trailer with his body oriented toward it. He did not have the cut off piece of beam in his hands; they were by his sides. As Austin collapsed, he pivoted to the right. He landed with his stomach on top of several beams that were protruding from the trailer.

20. Just before the accident Johnson touched the cut beam that had contact with the trailer and felt a mild electrical shock. He was wearing leather gloves that were wet and leather boots that were slightly wet on the inside. Also, Osborne received two substantial electrical shocks when he attempted to aid the victim. He was wearing leather boots and leather gloves over cotton gloves which were soaked with water.

21. Three workers quickly traveled past the obstructed walkway after the accident was known. Osborne went to the victim first. He was positioned near the corner of the trailer in the same area as the cable. He touched the victim and felt the electrical shock. He jerked his hand away, stepped back and turned. After the second electrical shock Osborne again jerked his hand away and turned. Kiser and Stewart traveled past the beam to reach the victim. When they touched the victim they did not feel an electrical shock. Both were wearing rubber boots. The third time Osborne touched the victim he felt only a slight electrical shock. No other witnesses described being near this area between Osborne's second and third contact with the victim.

22. No one else was shocked after Osborne felt the third electrical shock. Workers had touched the trailer and the victim while assisting with the situation.

VICTIM

23. Austin was wearing leather boots and leather gloves over cotton gloves. Forty-five minutes before the accident Austin said he had one foot that was a little bit wet. The gloves were soaked with water.

24. There is no record of underground hazard training for Austin.

25. Susan Venuti, Medical Examiner, concluded the cause of death to be low voltage electrocution.

SCENARIOS

26. The electrical shocks the two witnesses felt indicate that an event occurred that energized the trailer. No electrical energy was noticed prior to cutting the beam. The event occurred after the worker cut the beam and laid it on the mine floor. It occurred between the short time frame of when the worker released the beam, walked toward the front of the trailer, requested help and Johnson touched the beam. During this time period the victim was walking to the back of the trailer and no other people were close enough to the trailer or nearby cables to affect them.

27. The worker that lowered the beam to the mine floor did not receive an electrical shock at that instance. He was also wearing leather boots and leather gloves over cotton gloves which

were soaked with water. If the damage to the cable was already there, he would have been very susceptible to a shock because he had solid contact with the beam and ground.

28. If the cable was not in contact with the beam during the accident, then the path of the electrical energy would have been from the damaged area in the cable, through the water to the beam and trailer. The likelihood of the electricity becoming disrupted due to unintentional movement of the cable becomes remote. The damaged area on the cable would still have been in close proximity to the beam and in the water.

29. The preponderance of the evidence indicates the beam was placed or dropped on the cable. If placed on the cable, the reason the worker did not get shocked immediately was because the beam did not penetrate the cable instantly. Some time elapsed before the hot beam melted through the outer jacket of the cable and the insulation on the current carrying conductor. If the beam was dropped, the worker would not have contact with it or the trailer so there would be no path for electricity to flow through him. The ruptured insulation on the current carrying conductor allowed the flow of electricity from the conductor to the beam because they were in direct contact. All the metal on the trailer became energized because the beam was leaning on metal jacks still on the trailer. The victim touched the trailer or beams when he placed the cut off piece of beam on it. He was electrocuted when he completed the electrical circuit by providing a path to ground.

30. An event took place to energize the trailer. Likewise, another event occurred that removed the electrical energy from the trailer. The event to disrupt the flow of electricity from the trailer most likely was due to some of the movements in the obstructed walkway. One of the workers unknowingly moved the cable from direct contact of the beam and stopped the flow of electricity. The witnesses that observed the cable in relation to the beam saw it after the victim was removed from the protruding beams on the trailer. They would have seen the cable after it was moved.

31. The #1 Roof-Bolting Machine circuit breaker did not trip (de-energize) during the accident. This indicates the ground fault condition did not have a solid electrical connection back to the grounding medium. Therefore, while the ground fault condition allowed enough current to flow to electrocute the victim, it was not enough current for the protective devices to sense and thereby trip the breaker.

ROOT CAUSE ANALYSIS

A root cause analysis was performed on the accident. The following causal factors and root causes were identified.

1. Causal Factor - No pre-job risk analysis was conducted by the crew or supervisors to identify hazards.

   Corrective Action - An Action Plan was submitted to MSHA by the coal company. The plan states that all employees and contractors will be given additional training.

2. Causal Factor - The cable was not removed from the work area or protected from damage before a heavy object was placed on the mine floor.

   Corrective Action - An Action Plan was submitted to MSHA by the coal company. The plan states that all employees and contractors will be given additional training. Topics include protection of trailing cables from physical damage and examination of work areas.

CONCLUSION

On Tuesday, January 21, 2003, at approximately 1:55 p. m., Jackie Austin, age 33, a general laborer for Classic Company, an independent contracting company, was fatally injured at Dorchester Enterprises, Inc., Mine No. 4. The victim was electrocuted when he touched an energized metal trailer or the structural steel beams on it. He was assisting with the installation of steel beams and jacks as supplemental roof support. Another laborer had just cut a beam with a torch and laid one end on the mine floor while the other end leaned against metal jacks in the trailer. The victim was in the process of placing the cut off end of the beam onto the rear of the trailer. He collapsed and was subsequently pronounced dead.

The energized power cable for the #1 Roof-Bolting Machine was routed close to the trailer and the area where the beam was cut. This beam became energized as well as the trailer and the jacks and beams on the trailer. When the victim touched the energized trailer, or beams on it, he completed the electrical circuit by providing a path to ground and was electrocuted.

ENFORCEMENT ACTIONS

1. Section 103(k) Order No. 7322292 issued January 21, 2003, to Dorchester Enterprises, Inc., Mine No. 4: A possible fatal accident has occurred on the 001-0 MMU. Jackie Austin, Laborer, collapsed while working on the section and later died at a local medical facility. Other than power cables located nearby, no possible source of energy to cause his collapse is readily apparent. An order is hereby issued to protect the safety of all persons in the mine and all those who might be involved in the accident investigation until such time that the area can be determined to be safe.

2. Section 104(a) Citation No. 7323680 of 30 Code of Federal Regulations (CFR) 48.11(a)(1) issued April 24, 2003, to Dorchester Enterprises, Inc., Mine No. 4: During the course of the investigation of a fatality which occurred at this mine on 01/21/2003, it was determined from information gathered by MSHA from review of records and interviews with mine management that Jackie Lee Austin, General Laborer, had been performing work in the underground areas of the mine that included helping to install supplemental roof support on the active 001-0 MMU. No record could be provided to show that Austin had received the required hazard training prior to commencing such work duties in the underground areas of the mine. In the absence of such training, Jackie Lee Austin, General Laborer, is declared to be a hazard to himself and others.

3. Section 104(a) Citation No. 7323681 of 30 CFR 48.11(a)(1) issued April 24, 2003, to Classic Company: During the course of the investigation of a fatality which occurred at this mine on 01/21/2003, it was determined from information gathered by MSHA from review of records and interviews with mine management that Jackie Lee Austin, General Laborer, had been performing work in the underground areas of the mine that included helping to install supplemental roof support on the active 001-0 MMU. No record could be provided to show that Austin had received the required hazard training prior to commencing such work duties in the underground areas of the mine. In the absence of such training, Jackie Lee Austin, General Laborer, is declared to be a hazard to himself and others.

4. Section 104(a) Citation No. 7323682 of 30 CFR 75.517 issued April 24, 2003, to Dorchester Enterprises, Inc., Mine No. 4: The #2 AWG, 2 KV cable supplying (480 VAC, three phase) power to the #1 Roof-Bolting machine used in the active 001 section of this mine is not fully protected or adequately insulated. The outer jacket is ruptured in one area and the insulation on one current carrying conductor was also damaged.

5. Section 104(a) Citation No. 7323683 of 30 CFR 75.517 issued April 24, 2003, to Classic Company: The #2 AWG, 2 KV cable supplying (480 VAC, three phase) power to the #1 Roof-Bolting machine used in the active 001 section of this mine is not fully protected or adequately insulated. The outer jacket is ruptured in one area and the insulation on one current carrying conductor was also damaged.

Approved:

_____

Edward R. Morgan
District Manager

APPENDIX A

The following people provided information and/or were present during the investigation:

Cumberland Resources Corporation

Gail Kiser	General Mine Manager formerly Superintendent
Thomas Asbury	Safety Director
Hershel Bull	Electrical Consultant

Dorchester Enterprises, Inc.
Company Officials

Frank Bowman	Superintendent
Michael Bowman	Section Foreman
Jeffery Whisman	Chief Electrician

Dorchester Enterprises, Inc.
Company Employees

David Aistrop, Jr.	Shuttle Car Operator
Sammy Stallard	Repairman
Bobby Wise, Jr.	Miner Operator

Classic Company
Company Officials

John B. Stewart, Jr.	Contractor - Supervisor

Classic Company
Company Employees

Jason Johnson	General Laborer
John Osborne	General Laborer
Sam Sanders	General Laborer

Virginia Department of Mines, Minerals and Energy

John Thomas	Mine Inspector Supervisor
Robert Garrett	Coal Mine Technical Specialist – Electrical
Daniel Perkins	Coal Mine Technical Specialist
Forest Lambert, Jr.	Coal Mine Inspector

Mine Safety and Health Administration

Benjamin S. Harding	Supervisory, CMS&H Specialist, Ventilation formerly CMI Supervisor
Russell A. Dresch	Electrical Engineer
Arnold D. Carico	Mining Engineer
Larry Meade, Jr.	Coal Mine Safety and Health Inspector

Approval and Certification Center

David Creamer	Chemist, Materials and Explosion Testing Branch

APPENDIX B