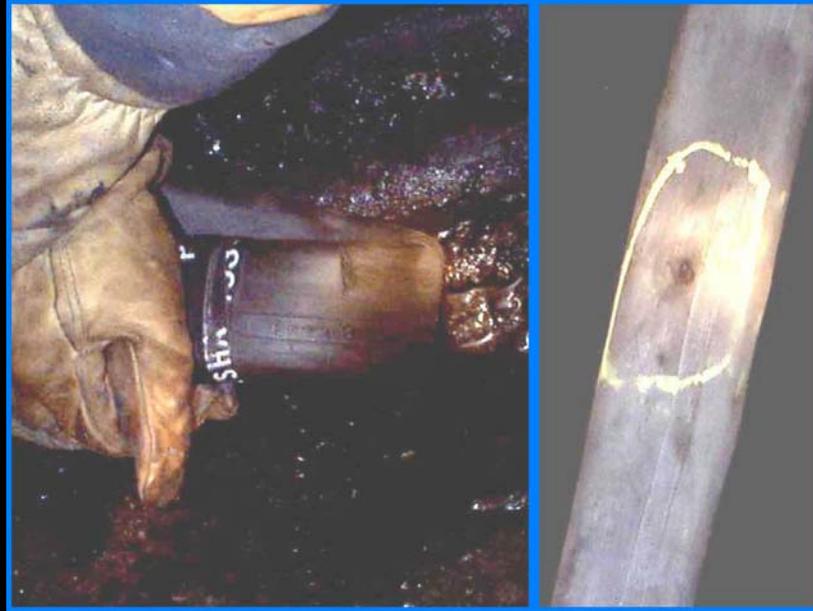


*This presentation is for illustrative and **general** educational purposes only and is not intended to substitute for the official MSHA Investigation Report analysis nor is it intended to provide the sole foundation, if any, for any related enforcement actions.*

# GENERAL INFORMATION

## Coal Mine Fatal Accident 2003-21



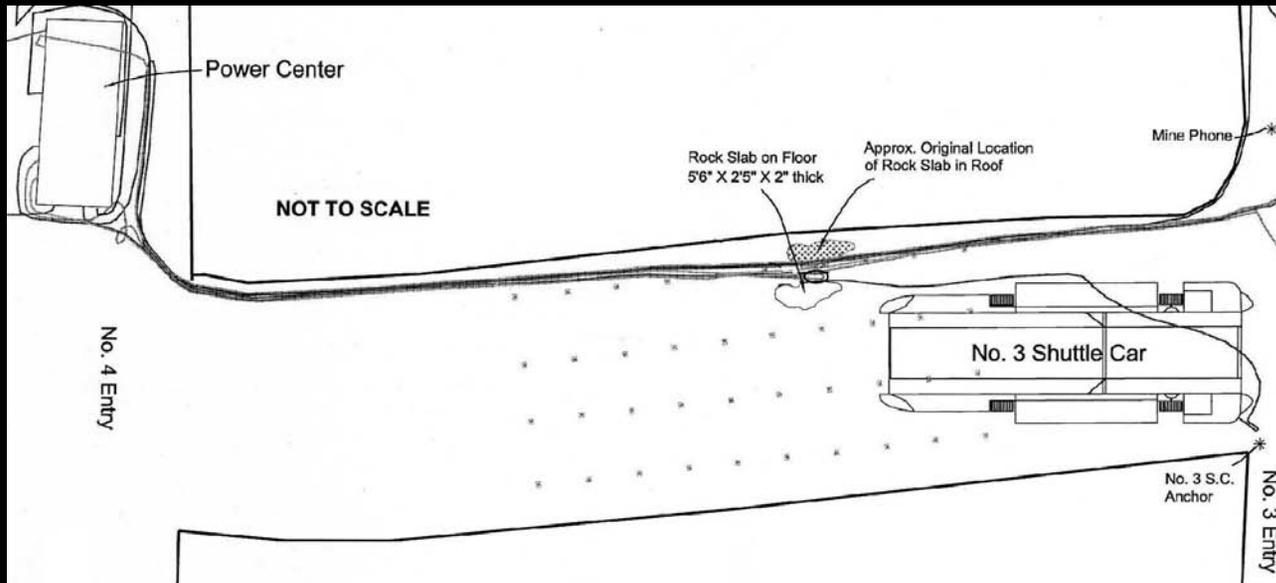
Operator:	Performance Coal Company
Mine:	Upper Big Branch Mine-South
Accident Date:	July 19, 2003
Classification:	Electrical
Location:	District 4, Raleigh County, WV
Mine Type:	Underground
Employment:	177
Production	10,000 tons/day

# ACCIDENT DESCRIPTION

- At ~4:00 p.m., the 9-man evening shift crew for the No. 17 Headgate Section entered the mine and traveled to the Headgate No.17 Section to produce coal. Upon arrival at the working section, the section foreman gave a safety talk and assigned work duties to the crew.
- The No. 3 shuttle car operator noticed that his shuttle car wasn't tramming correctly. After determining that the shuttle car needed hydraulic oil, he located two cans of oil which he emptied into the shuttle car. He then resumed hauling coal from the No. 3 face. When he pulled onto the section feeder with his 3<sup>rd</sup> load, his shuttle car lost power, also blocking the No. 2 shuttle car from reaching the feeder.
- After the shuttle cars did not return to the face for loading, the continuous mining machine operator walked toward the feeder. The No. 3 shuttle car operator went to the power center, where he summoned electrician (victim) to see if the breaker for the No. 3 shuttle car had opened. The electrician tried setting up the breaker 2 or 3 times, but it would not stay in.

# ACCIDENT DESCRIPTION

- The continuous mining machine operator and the electrician began looking for damage in the No. 3 shuttle car cable as they walked from the power center along the left rib, where the trailing cables were lying on the mine floor. They found a 2" thick rock, measuring 5-½' x 2-½', lying on both shuttle car trailing cables, approximately 4-½" from the inoperative No. 3 shuttle car.
- The No. 3 shuttle car operator and the electrician flipped the rock off of the cables and observed an area in the No. 3 shuttle car cable, which appeared to be swollen. They did not detect damage to the outer insulation in this portion of the cable.

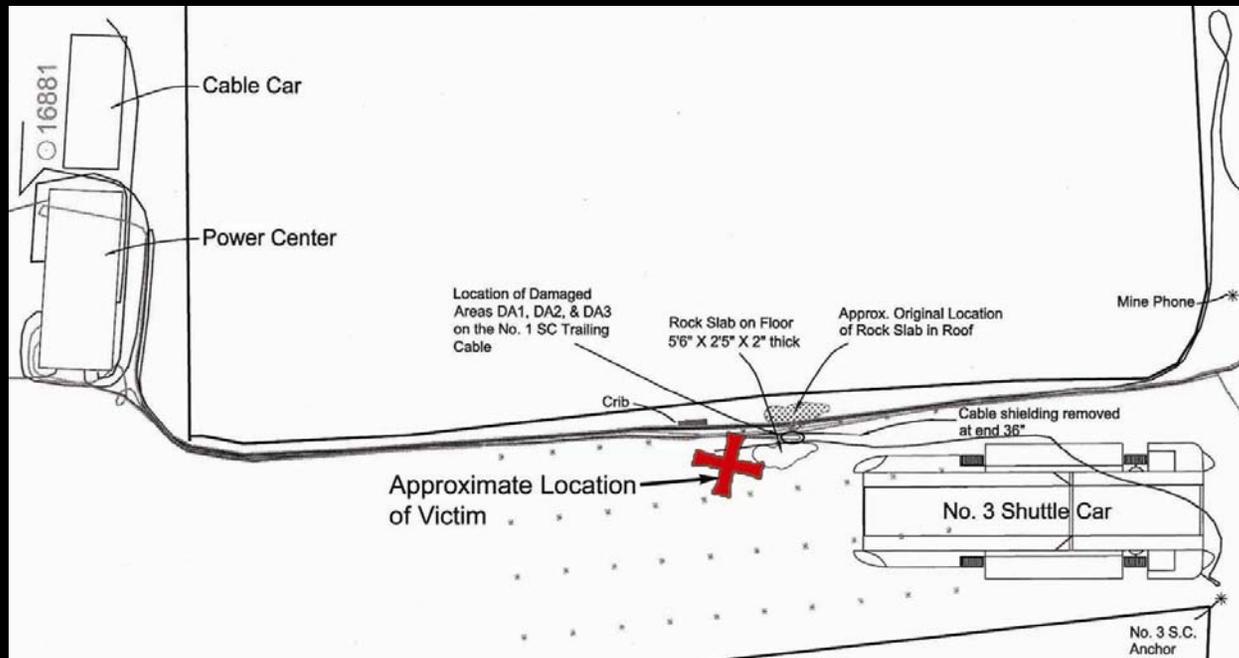


# ACCIDENT DESCRIPTION

- The electrician returned to the power center, where he unplugged and locked out the visible disconnect for the No. 3 shuttle car cable. He then cut open the swollen area of the cable and found that 2 phase conductors were severed.
- In order to move the No. 3 shuttle car off of the feeder so that production could continue, the electrician made a temporary splice in the cable and went back to the power center, attached the plug to the receptacle, and energized the breaker. The lights functioned; however, the shuttle car tram motors remained inoperative.
- The section foreman instructed the miners to use the No. 2 shuttle car to pull the No. 3 shuttle car off the feeder. Once this was completed, No. 3 shuttle car operator asked the section foreman if he wanted him to stay and assist the electrician, but he was instructed to run the No. 1 shuttle car.
- The section foreman returned to the No. 3 face. Finding that the cut was nearly finished, he positioned the other continuous mining machine in the face of the No. 2 left crosscut.

# ACCIDENT DESCRIPTION

- After finishing the cut, the continuous mining machine operator checked the electrician's progress. He saw the electrician pulling cable off the No. 3 shuttle car reel and throwing it over the discharge end of the shuttle car. The continuous mining machine operator then returned to the face of the No. 2 left crosscut to resume mining.
- Soon after, a roof bolting machine operator noticed a light shining against the mine roof in the crosscut between No. 3 and No. 4 entries. As he walked toward the light, he saw the electrician lying on the mine floor, with the No. 3 shuttle car trailing cable lying across his body.



# ACCIDENT DESCRIPTION

- The roof bolting machine operator immediately summoned help from the continuous mining machine operator, who kicked the cable out of the victim's right hand.
- Other crew members soon responded and CPR was administered.
- After performing CPR, one of the crewmembers felt a tingling sensation as he got up from the mine floor, which he believed was caused by electricity. He then de-energized the power center that supplied electricity to the trailing cables.
- The victim was transported to a local hospital, and later to the Medical Examiner's Office, where he was pronounced dead.

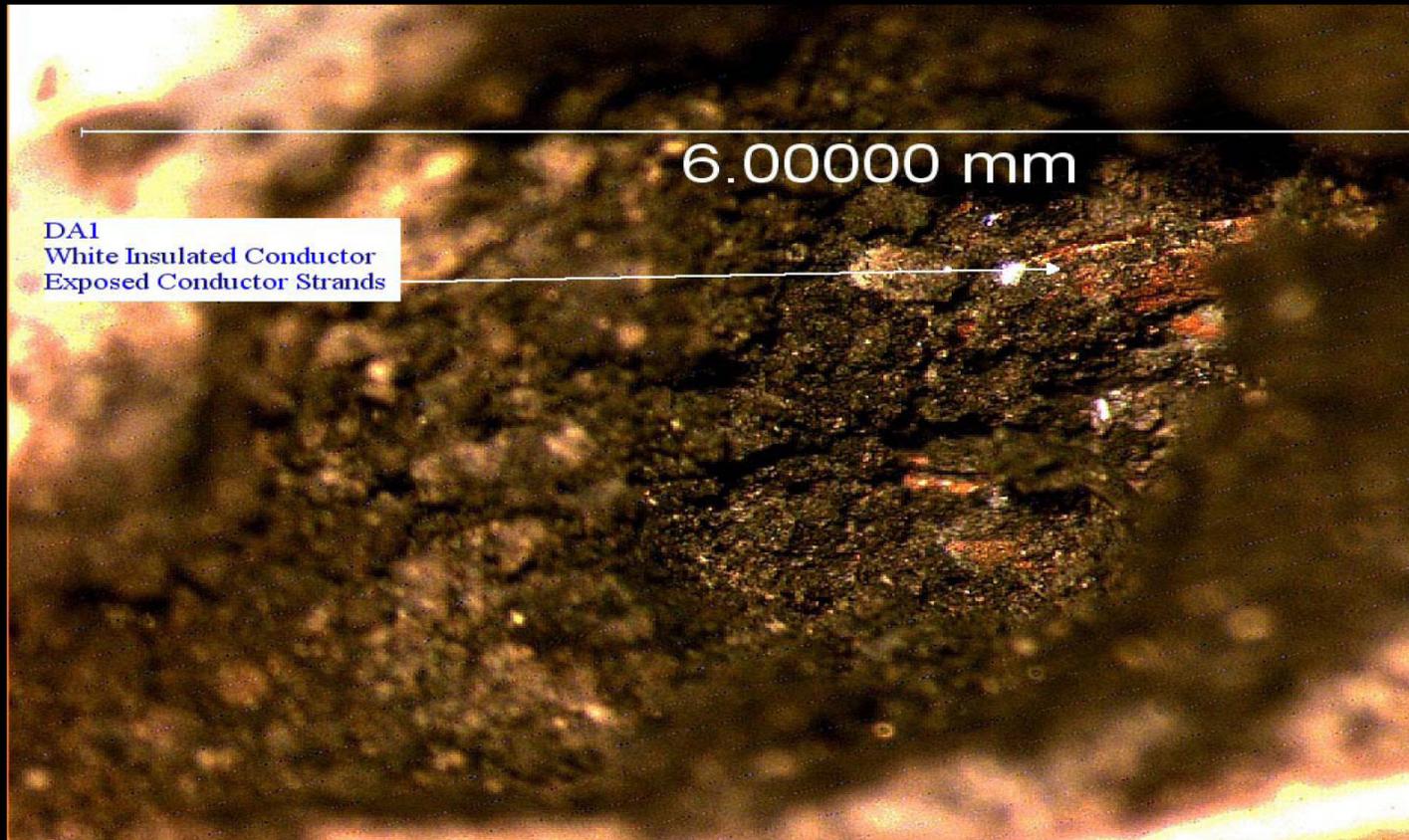
# DISCUSSION

- The victim had made a temporary splice in the No. 3 shuttle car cable; but the shuttle car remained inoperable.
- He pulled cable off of the cable reel to position the cable to make a permanent splice.
- Cuts in the separated leads of the No. 3 shuttle car cable suggested that the victim was attempting to find other damaged areas. The outer jacket had been removed for ~2' and the insulated leads had been separated.
- The victim was found lying on his back, ~10' from the No. 3 shuttle car. The cable extending from the No. 3 shuttle car was found in his right hand, lying diagonally across his body. The end was cut so that all conductors were flush and an empty outer jacket extended ~6" past the conductors.
- Cable cutters were not found, which indicated that the victim was not severing the cable at the time of the accident.
- One point of contact with the electrical energy was specified in the autopsy report as an "electrocution burn on the right 2nd finger." Other points of contact could not be determined.
- The position in which the victim was found indicated that he fell on his back after receiving the electrical shock.

# DISCUSSION

- All cables receiving power from the section power center were inspected, resulting in 13 citations and 2 orders issued as non-contributing violations.
- Inadequate electrical examinations were performed and recorded. The No. 2 shuttle car cable contained an area damaged by heat for a distance of 150'. This hazard was known by examiners, but not reported or corrected.
- 6 electrical cables and a water line were routed along the coal rib in the No. 4 left crosscut (accident site) on the mine floor. 5 of the electrical cables, including the damaged No. 1 shuttle car cable, were energized. The No. 3 shuttle car cable, which the victim was working on, was not energized.
- The No. 3 shuttle car trailing cable's visual disconnect was unplugged and locked out when the accident occurred.

# DISCUSSION



- 3 damaged areas on the No. 1 shuttle car cable were found in No. 4 left crosscut, each exposing an energized 480 VAC conductor.

# DISCUSSION

- These damaged areas were discovered in a 32-½" span of the cable located 1-4' from the victim, where he was performing electrical work on the No. 3 shuttle car cable when the accident occurred.



- The electrical work was being performed in an area of wet and muddy conditions. The mine floor was saturated with mud and two to three inches of standing water. The energized, electrical cables, including the damaged No. 1 shuttle car cable, were laying in the mud and water.

# DISCUSSION

- While examining the No. 3 shuttle car cable for damage, the No. 3 shuttle car operator and the victim found a 2" thick rock, measuring 5-½' x 2-½', lying on several trailing cables ~4-½' from the No. 3 shuttle car.
- They flipped the rock off of the cables and noticed a swollen area on the No. 3 shuttle car cable. However, they did not examine the other cables for possible damaged areas.
- This indicates that the miners did not consider the possible damaging affects of rock falling on cables other than that associated with known operational problems.
- A chip of rigid, non-metallic, granular material was embedded in the white insulation and granular debris was found between the white insulation and the conductor at the damaged area labeled DA3.



# ROOT CAUSE ANALYSIS

*Causal Factor:* Electrical work was being performed in wet and muddy conditions and in close proximity to energized electrical cables.

*Corrective Actions:* When a damaged portion of a cable is lying in the immediate vicinity of other energized cables, certified electricians should de-energize all of the cables or move the damaged portion of the cable a substantial distance from the energized cables, to a dry area if possible, before repairs are made.

# ROOT CAUSE ANALYSIS

*Causal Factor:* The No. 1 shuttle car cable was laying in mud and water and contained three undetected damaged areas; exposing two energized 480 VAC phase conductors. Stray electrical energy originated from these damaged areas.

*Corrective Actions:* The examination of trailing cables covered with mud and water makes detection of damaged areas of the cable more difficult. Personnel performing such examinations should take appropriate measures to ensure that a complete and thorough examination is performed.

# ROOT CAUSE ANALYSIS

*Causal Factor:* The accident resulted from failure to protect cables from damage. Several damaged cables were discovered during the investigation. In addition to the damaged No. 1 shuttle car cable, other damaged equipment or inadequately spliced cables were found on the following equipment: No. 2 shuttle car, No. 3 shuttle car, No. 2 roof bolting machine, No. 1 continuous mining machine, and the coal feeder.

*Corrective Actions:* The first line of defense in protecting personnel from the hazards of damaged power cables is to prevent the damage from occurring. Procedures should be implemented to protect the cables from potential sources of damage.

# CONCLUSION

The victim was electrocuted when he came into contact with stray electrical energy released by the damaged trailing cable that was supplying power to the No. 1 shuttle car. The stray electrical current resulted from undetected damage to the No. 1 shuttle car cable which exposed two energized 480 VAC phase conductors. The root cause of the accident was mine management's failure to ensure that proper precautions were taken when conducting electrical work in wet and muddy conditions. Failure to adequately protect electrical cables from damage also contributed to the accident.

# ENFORCEMENT ACTIONS

## 104(a) Citation for a violation of 30 CFR 75.517

The No. 2 AWG trailing cable, which supplies 480 (VAC) power to the No. 1 shuttle car, is not insulated adequately nor fully protected. There are four damaged areas in the cable causing two energized power conductors and one grounding conductor to be exposed. The damaged cable was located on the No. 17 Head Gate section, and the damaged areas were discovered in the crosscut between the No. 4 section power center entry and the No. 3 coal feeder entry. The section power center is located close to surveyor spad No. 16881. This violative condition is a contributing factor to the fatal accident that occurred on July 19, 2003.

# BEST PRACTICES

- Protect electrical cables from damage by hanging, shielding, or location, as appropriate to the situation.
- Properly examine all cables for damage during required weekly examinations.
- When repairing cables in the immediate vicinity of energized cables, take electrical measurements to test for the presence of unwanted electrical power, especially in wet and/or muddy areas.