

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION

COAL MINE SAFETY AND HEALTH

REPORT OF INVESTIGATION

UNDERGROUND COAL MINE

FATAL ELECTRICAL ACCIDENT
October 23, 2004

at

Southern Crescent Mine
Omega Mining, Inc.
Honaker, Russell County, Virginia
ID No. 44-06777

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

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OVERVIEW

On Friday, October 29, 2004 at 3:00 p.m., Dennie Ray Leonard, Chief Electrician, passed away at Vanderbilt Burn Center from injuries received on October 23, 2004, at Omega Mining Inc.'s, Southern Crescent Mine. Leonard, age 56, had 39 years mining experience with 35 years as an electrician. The accident occurred when the victim and two other employees were installing a new transformer bank at the mine site. During the setup, the victim apparently went to install the grounding clamps to the incoming 12,470 VAC high-voltage powerlines prior to deenergizing them. The victim was on a metal platform when he attempted to attach the grounded clamp to an energized bushing of a recloser. The resulting arc burned the victim and he collapsed on the platform.

The cause of the accident was failure to deenergize the high-voltage circuit before attempting to ground it at the connection to the recloser's bushings. As the grounded clamp neared the bushing, it arced and ionized the air between the bushings of the recloser. This resulted in a three phase fault and an intense discharge of heat that burned the victim. The three phase fault opened three fuses on the power company's line at the mine's metering point and one fuse on the mine's fused disconnects.

GENERAL INFORMATION

Omega Mining, Inc.'s Southern Crescent Mine, I.D. No. 44-06777, is an underground coal mine located off of State Route 704 (Bee Hive Hollow) adjacent to State Route 624 in Russell County, Virginia near Honaker. The principal officers for the mine at the time of the accident were:

Allen Whited	President
Larry Stinson	Vice President
Lynn Keene	Secretary/Treasurer
Danny Smith	Superintendent

Mining under current management began on June 8, 2004. The underground mine has 5 drift openings into the Lower Banner coal seam. The only active section is located approximately 1,200 feet from the portals. The mining height averages 40 inches. The last air sample collected showed zero cubic feet of methane liberation in a 24-hour period. The immediate roof consists of 4 to 12 inches of shale. The main roof consists of 10 feet or more of sandstone.

Twenty-three 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 No. 2 Mains Section on the day and evening shifts. Maintenance and utility work are performed on the midnight shift. The mine produces an average of 650 tons of material per day.

The method of mining is room-and-pillar. Coal is produced by 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 haul the raw product from the mine to the preparation plant. A roof bolting machine is used to install roof support. Employees and supplies are transported to the section via battery-powered mantrips.

The Mine Safety and Health Administration (MSHA) completed the last regular health and safety inspection of the mine on September 30, 2004; however, a regular safety and health inspection commenced on October 13, 2004, and was ongoing at the time of the accident. The mine has not been in operation long enough to determine the Non-Fatal Days Lost (NFDL) injury incidence rate for the mine. The National NFDL rate for 2004 is 5.48.

DESCRIPTION OF THE ACCIDENT

On Saturday, October 23, 2004, during a non-production shift, personnel at Omega Mining Inc.'s Southern Crescent Mine were performing maintenance and utility work underground. In addition, employees were upgrading the mine's main substation on the surface. The day shift arrived between 6:30 and 7:00 a.m. Four miners and the Mine Foreman, Ralph Campbell, traveled underground to begin work. Albert Cornwell, Outside Man, Darrell Anderson, Electrician, and Dennie Leonard, Chief Electrician, remained on the surface to work at the substation.

The mine was preparing to upgrade to a super section, and the existing surface substation was inadequate to meet the power demands. The existing 750 KVA transformer in the enclosed substation was to be replaced with three 500 KVA oil-filled transformers that were installed adjacent to the enclosed substation.

Cornwell began work by mounding up dirt at the base of the power pole to help Leonard open the fused disconnects. In the past, Leonard had trouble reaching the fused disconnects on the pole with the hot stick. The oil-filled transformers had already been placed next to the enclosed substation, but had to be rotated to position the high-voltage bushings away from the enclosed substation. Cornwell used a front-end loader to reposition the transformers; then he began to work on the fence to surround them. At approximately 2:00 p.m., Leonard deenergized the substation. When the power was disconnected, the mine foreman and the underground crew were on the surface leaving the mine property.

After Leonard opened or pulled the disconnects, he grounded the deenergized high-voltage lines by attaching a clamp to the frame of the metal platform, and a clamp to the connection at each bushing of the recloser. Leonard and Anderson disconnected the incoming high-voltage lines from the transformer inside the enclosed substation and connected them to the primary of the oil-filled transformers. At approximately 4:15 p.m., Anderson removed the grounding clamps and Leonard closed the disconnects, thereby energizing the substation. Leonard planned to allow the transformers to warm up to ensure they were in good condition before continuing work.

Leonard, Anderson, and Cornwell (the only men on mine property at this time) waited in the mine office and discussed how they were going to proceed with the rest of the installation. They discussed completing the fence to enclose the new transformers, wiring the secondary, and checking the phasing on the underground equipment. After 15 to 20 minutes, the three men left the office and Leonard asked Anderson where the grounding clamps were. Anderson replied that they were just inside the gate leading to the recloser. Leonard walked in the direction of the recloser while Anderson and Cornwell walked to the opposite side of the transformers, out of sight of Leonard. At approximately 4:40 p.m., Leonard mounted the metal platform and attempted to

ground the high-voltage lines as before. When Leonard contacted the bushing of the recloser with the grounded clamp, a high energy electrical arc was created that resulted in a three phase fault. This fault caused all three power company fuses to blow. Anderson and Cornwell reported seeing a flash and hearing a blast.

The two men ran to Leonard and found him collapsed on the platform. Anderson told Cornwell to pull the disconnects. After the disconnects were pulled, Cornwell came back to the accident scene. Anderson told Cornwell to call 911. Anderson assessed the victim's condition and performed first-aid while he was on the platform. The victim regained consciousness and began to move. Anderson called to Cornwell, who was still on the phone, to help him move the victim off the platform. Cornwell finished relaying the information to the rescue squad, and then helped Anderson move him to the ground. Cornwell left and returned with a cushion for the victim to lie on. He then returned to the mine office and called Danny Smith, Superintendent, and Allen Whited, President. Cornwell went back to Anderson and the victim.

Anderson and Cornwell stayed with the victim until the paramedics from New Garden Rescue Squad arrived. The paramedics transported the victim to a local business where Med Flight arrived to take him to Bristol Regional Medical Center in Bristol, Virginia. From Bristol Regional Medical Center the victim was transferred to Vanderbilt Burn Center in Nashville, Tennessee. The victim passed away on Friday, October 29, 2004.

INVESTIGATION OF THE ACCIDENT

On October 23, 2004, at about 5:50 p.m., Danny Smith, Superintendent, called Edward Morgan, District Manager, to inform the Agency of the accident. The investigation team arrived at the mine around 7:50 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 Omega Mining, Inc.; Virginia Department of Mines, Minerals, and Energy (DMME); and MSHA arranged a joint investigation at the mine.

The scene of the accident was inspected, photographed, and a scale drawing was developed. The sequence of events leading up to the accident was determined from mine personnel present at the time of the accident. All required electrical protections at the substation were examined and tested. Interviews were conducted with five people on October 25, 2004. The interviews were tape recorded for the record.

DISCUSSION

Physical Factors

The accident occurred on the surface during daylight hours. The disconnects could be seen from the location where the victim attempted to ground the high-voltage lines. Two men were in the vicinity of the accident but were not positioned to witness it. There were properly rated high-voltage gloves and a hot stick available at the mine. The proper use of this equipment is to use high-voltage gloves and a hot stick to open (pull) and close pole-mounted disconnects, and high-voltage gloves to install and remove grounding clamps. Contrary to this, the victim was wearing leather gloves when he attempted to attach the grounding clamps to the bushings.

Human Factors

The victim had 35 years experience as an electrician, and he had already properly disconnected and grounded the circuit once earlier in the day.

Fatigue due to a long shift at the end of the week may have contributed to the victim being distracted or forgetting to disconnect the power first.

Test Results

It was readily apparent that the accident occurred on the primary (source) side of the transformer, but the required protections on the secondary (load) were tested to ensure they worked. The ground field, ground resistor, over current, short circuit, and grounded phase protection were tested at the substation. The over current and short circuit protections, not required by MSHA's regulations, were also tested on the primary recloser. All devices tested were operational and the trip settings were adequate.

Equipment Involved in the Accident

The victim was attempting to ground the high-voltage line at the bushing connections of a General Electric Oil-Blast Circuit Breaker, Type FLO-14.4-100-5. The high-voltage power was received from American Electric Power's (AEP's) step down transformer that was wye connected and solidly grounded on its secondary. AEP's powerlines had fused disconnects installed at the second to last power pole. At the last power pole, the mining company had fused disconnects. A 2/0 AWG, 3 conductor, type MP-GC mine power cable was used from the load side of the fused disconnects to the connections on the oil circuit breaker bushings. The grounding clamp was attached to the grounded metal platform on which the victim was standing.

Tom Hicks, Serviceman, and Johnny Vencill, Engineering Technician, from AEP, replaced the blown fuses on AEP's powerline during the investigation. The men determined the size of the fuses and confirmed that all three fuses were open. Two of the fuses were 40 amp, and one was a 30 amp. AEP replaced them with 40 amp fuses. It was also determined that one of the mine's fuses had blown. The mine's disconnects had three 40 amp fuses, and all were replaced with 30 amp fuses.

Changes at the Substation

The existing surface substation was inadequate to meet the power demands of the proposed super section. The substation received primary power at 12,470 volts from the secondary of AEP's wye connected, solidly grounded step down transformer. The output of the secondary of the mine transformer was 4,160 volts. The existing 750 KVA transformer in the enclosed substation was to be replaced with three 500 KVA oil-filled transformers that were installed adjacent to the enclosed substation. The secondary of the new transformers was to be routed through the enclosed substation where required protections were to be provided before being used underground. The primary and secondary voltages of the new transformers remained the same as the old.

ROOT CAUSE ANALYSIS

An analysis was conducted to identify the most basic causes of the accident that were correctable through reasonable management controls. During the analysis, causal factors were identified that, if eliminated, would have either prevented the accident or mitigated its consequences.

Listed below are causal factors identified during the analysis and their corresponding corrective actions implemented to prevent a recurrence of the accident:

Causal Factor: The root cause of the accident was the failure to open the fused disconnects before attempting to ground the circuit at the recloser.

Corrective Action: Management has developed and distributed a procedure checklist outlining the steps that should be taken when disconnecting power at the substation. Affected miners have been retrained in the procedure.

CONCLUSION

The accident resulted from failure to follow the proper sequence of actions necessary to safely deenergize and ground the incoming high-voltage circuit. When the high-voltage circuit was grounded before it was deenergized, a three phase fault was created that released an intense discharge of heat that burned the victim and caused the fatal injury.

Approved:

Edward R. Morgan
District Manager

ENFORCEMENT ACTIONS

1. Section 103(k) Order No. 7337205 issued October 23, 2004, to Omega Mining, Inc., Southern Crescent Mine: This mine has experienced an accident on the surface that has resulted in an injury to an employee of the mine. This order is issued to assure the safety of any person at the mine until an investigation is made of the mine to determine that the mine is safe. Only those persons selected from company officials, the miner's representatives, and other persons deemed by MSHA to have information relevant to the investigation may enter the area.
2. Section 104(a) Citation No. 7335311 of 30 Code of Federal Regulations (CFR) 77.501 issued February 24, 2005, to Omega Mining, Inc.; Southern Crescent Mine: Based on information revealed during an accident investigation, electrical work was performed on October 23, 2004, on a 12,470 VAC high-voltage distribution circuit before the disconnecting device was opened and suitably tagged. Dennie Leonard, Chief Electrician, attempted to install grounding clamps on the high-voltage circuit prior to deenergizing and tagging the circuit.

APPENDIX A - Persons Participating In The Investigation

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

Omega Mining, Inc.

Allen Whited	President
Ralph Campbell	Foreman
Daniel Smith	Superintendent

American Electric Power Company

Tom Hicks	Serviceman
Johnny Vencill	Engineering Technician

Virginia Department of Mines, Minerals and Energy

Frank Linkous	Director/Chief Division of Mines
Bobby Garrett	Electrical Specialist
Dwight Miller	Electrical Specialist
Bill Messick	Coal Mine Inspector
Gary Davis	Electrical Specialist
Tom Martin	Technical Specialist
Opie McKinney	Coal Mine Inspector Supervisor
Joe Altizer	Coal Mine Inspector

Mine Safety and Health Administration

Edward Morgan	District Manager
Norman Page	Assistant District Manager
Jim Poynter	Coal Mine Safety and Health Supervisor
Russell A. Dresch	Electrical Engineer
Jason D. Lane	Electrical Engineer
Fred Martin	Coal Mine Safety and Health Inspector
Tony Arena	Electrical Specialist
Carl Duty	Coal Mine Safety and Health Inspector
Bob Baker	Educational Field Services
Larry Worrell	Coal Mine Safety and Health Supervisor