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UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINSTRATION

DISTRICT 7

REPORT OF INVESTIGATION

Surface of Underground Coal Mine

FATAL MACHINERY ACCIDENT

June 9, 2003

Mine No. 4
Calvary Coal Co. Inc.
Smilax, Leslie County, Kentucky
I.D. No. 15-16349

Accident Investigators

Arthur V. Smith
Mine Safety and Health Inspector

Eugene Hennen
Mechanical Engineer

Originating Office
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District 7
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Accident Site

This image shows the steel structure which was lifted off the Pemco electrical substation by this bucket truck. The structure is lying against the boom of the bucket truck after the fall.

OVERVIEW

On June 9, 2003, Randall Osborne, a 49-year old mine manager with 29 years mining experience, and three other miners were dismantling a de-energized Pemco electrical substation at a surface area of Calvary Coal Co., Inc., No. 4 underground mine. Osborne was operating a Simon-Telelect 42-foot aerial bucket truck, from within the elevated bucket, which was attached to the steel I-beam structure of the substation by a winch (JIB Crane) and nylon rope assembly. When Osborne used the winch (JIB Crane) to lift the steel structure, the nylon rope broke, causing the aerial bucket to move upward suddenly throwing Osborne out of the bucket. Osborne, who was not wearing a safety belt or harness, fell 29 feet to the ground causing fatal injuries.

GENERAL INFORMATION

Calvary coal mine No. 4, is a bituminous underground coal mine located at Smilax, Leslie County, Kentucky. The mine is owned and operated by Calvary Coal Co. Inc. The principle-operating officer is Charles Collins, President. This mine works three eight-hour shifts with a total employment of 43 miners working five days a week.

Coal is extracted from the underground mine and is transported by truck to Blue Diamond Coal Preparation Plant for processing. The finished product is then transported to the customer by rail or truck.

The last regular inspection of this operation was conducted on May 14, 2003. The Non-Fatal Days Lost (NFDL) Incidence rate for Calvary Coal Incorporated, No. 4 mine, is 7.50. The NFDL rate for the nation for underground coal mines is 5.89.

DESCRIPTION OF THE ACCIDENT

The day shift began at 6:00 a.m. on Monday, June 9, 2003, at the Calvary Coal Co. Inc., No. 4 Mine. The mine manager, Randall Osborne (victim), entered the repair shop at 7:30 a.m. He told David Roberts (repairman & electrician) and Dean Sizemore (welder) to go to the parking area and remove the steel I-beam structure from the de-energized Pemco electrical substation. The 21-feet 10 ½-inches tall by 9-feet 6-inches wide structure consisted of several six-inch steel I-beams, 1 steel plate, and 20 large insulators. The substation had been moved to the parking area on Saturday for dismantling and transport.

After Roberts and Sizemore gathered torches and necessary tools, Roberts moved the Simon-Telelect model T4042 aerial bucket truck to the work site, parking it near the substation. Osborne drove his personal Jeep to the parking area. This area was used as a refueling station, to park coal trucks, and to store mine supplies. Jeff Sizemore (front-end loader operator) drove his front-end loader to the parking area to refuel and spoke with

Osborne, Roberts and Dean Sizemore. Osborne informed Jeff Sizemore they would call for him to bring the front-end loader to move the substation when needed.

Osborne lowered the outriggers and entered the aerial bucket. He then elevated the bucket and placed a nylon winch rope around the top beam of the steel structure, placing its hook back around the rope. Osborne then told Dean Sizemore to cut the bolts that held the steel structure onto the substation. Sizemore cut the bolts and two welds, freeing the structure from the substation. Roberts, using a hammer and punch, knocked the bolts out of their holes. Roberts then called on the citizen band radio for Jeff Sizemore to bring the front-end loader to pull the substation away from the structure.

The front-end loader approached the substation from the side opposite of Osborne. Roberts attached a chain to the substation and pulled the chain by hand toward the front-end loader. Osborne used the winch (JIB Crane) to lift upward on the steel structure, which bent the I-beam. At this time, the nylon rope failed at the point where it contacted the edge of the steel beam, causing the aerial bucket to move upward suddenly throwing Osborne backwards out of the bucket. As he fell to the ground, he struck the steel structure several times and the bumper of the aerial bucket truck.

Jeff Sizemore saw the accident and called on his citizen band radio to the shop for help. Glen Boggs, at the shop, heard the call and notified Rick Sandlin, Safety Director, of the accident. Dean Sizemore attended to Osborne until Rick Sandlin (MET) came and took over administering first aid. Sandlin said that Osborne was breathing, but unconscious. The Leslie County Emergency Ambulance arrived at the scene at 8:54 a.m. and took Osborne to the Mary Breckinridge Hospital at Hyden, KY, arriving at 9:20 a.m. Mr. Osborne was pronounced dead by Leslie County Coroner Jim Couch at 10:20 a.m.

INVESTIGATION OF ACCIDENT

Jim Langley, Supervisory Mine Safety and Health Inspector, was notified at 09:05 a.m. on the day of the accident by a telephone call from James G. Napier, Production Clerk and Purchasing. An investigation was started the same day. An order was issued pursuant to section 103 (k) of the Mine Act to ensure the safety of miners.

MSHA's accident investigating team traveled to the mine, conducted a physical examination of the accident scene and equipment involved in the accident, interviewed persons, and reviewed training records, conditions, and procedures relative to the accident. MSHA conducted the investigation with the assistance of mine management, the Kentucky Department of Mines and Minerals and the miners.

DISCUSSION

1) MACHINE INFORMATION: The aerial bucket truck consisted of a Model T-4042 Simon-Telelect aerial device with Serial Number T4000-1006-CY and a Model F800 Ford truck chassis with Vehicle Identification Number 1FDPF82J3MVA22368. Both the aerial device and the truck chassis was manufactured in 1991. The aerial device is designed to be used around energized electric lines. The aerial device had two man buckets with a jib crane between them. The boom on the aerial device had a reach of 42 feet. The maximum lifting capacity of the jib crane was 2,000 pounds. Controls to operate the boom and the jib crane were located on the left bucket when looking toward the rear of the boom truck. The GVW for the truck chassis listed on the VIN plate was 27,080 pounds. The truck had a 7 liter electronic fuel injected gasoline engine, a five speed manual transmission and a two speed differential, with the control on the side of the transmission shifter. The truck chassis had a PTO that drove the hydraulic pump for operating the aerial device. The control for the hydraulic PTO was located under the dash to the left of the steering wheel in the cab of the truck. The truck had a winch located in the front bumper of the chassis. The control for the winch was located on the floor of the cab to the right of the transmission shifter.

The truck was first owned by Jackson County Co-op, which is now Jackson Energy Company. The truck was delivered to Jackson County Co-op in 1991. Calvary Coal Company, the second owner of the aerial bucket truck, received the truck on September 9, 2000.

2) JIB CRANE: The jib crane, which was located between the two buckets, was designed to be an implement crane. According to the load chart for the aerial device, the jib crane was designed for a maximum load of 2000 pounds, depending on the orientation of the booms. Upon arrival at the accident site, the upper boom arm position was estimated to be less than 30 degrees above horizontal, and the distance between the man bucket pivot point and the crane rope was approximately 12 ½ inches. NOTE: The upper boom arm position was estimated to be less than 30 degrees because this portion of the boom angle decal was missing. According to the load chart, the maximum load the jib crane was designed to lift with the boom in this position was 1000 pounds minus the weight of personnel and tools in the bucket. The weight of the operator plus the tools in the bucket was approximately 300 pounds. When 300 pounds is deducted from the 1000 pounds on the load chart, the maximum safe load for the jib crane with the upper boom in the position found upon arrival at the accident site was approximately 700 pounds. The weight of the electrical substation steel beam structure, including hardware mounted to the structure, being lifted at the time of the accident was approximately 4000 pounds. The weight being lifted at the time of the accident was more than five times the weight recommended in the load chart.

During the investigation the load chart was found in two locations. One location was a decal located to the right of the controls located by operator's bucket. This decal was worn and no longer legible. Several copies of the load chart were located in the

operator's manual which was found under the seat in the truck cab. In order to use the load chart the operator must know the angle of the upper boom. The bucket truck had an upper boom angle indicator which is located near the operator's control. The dial of the upper boom angle indicator is a decal which is located on the side of the upper boom. The hand of the indicator is free to rotate and always points down. As the angle of the upper boom changes, the indicator hand shows the angle of the boom on the decal. As noted above, a portion of this boom angle indicator decal was missing. The exact angle of the upper boom, as found upon arrival at the accident site, was not visible since this portion of the decal was missing.

3) ROPE: The rope that failed during the accident was not identified. Some rope manufacturers place colored strands in the outer layer of their ropes for manufacturer identification. Attempts to find colored strands and determine the manufacturer of the subject rope were not successful.

The rope on the jib crane at the time of the accident was a ½ inch diameter fiber rope. The rope had a fiber core with the double braid cover. The rope appeared to have been a white rope with an orange coating placed on it. The end of the rope had been wrapped a around a thimble and braided back into itself to form an eye for the shackle that attached the hook to the rope. The rope failed approximately nine inches from the edge of the thimble. At this location, the orange coating was present on both the outer surface of the rope and the inner strands of the rope. During the accident investigation, approximately an 8 feet section was cut from the rope remaining on the bucket truck. Visual examination of the cut sections showed that the orange coating was only present on the outer surface of the rope.

The jib crane rope installed on the bucket truck when the bucket truck was manufactured was a ½ inch diameter 2-in-1 Nystron rope manufactured by Samson Rope Technologies. This rope had the same construction as the rope on the machine at the time of the accident. Personnel at Samson Rope were contacted and they stated that their 2-in-1 Nystron rope had a single blue strand woven in the outer cover and an orange coating over the outside of the rope. Information received from Samsom Rope Technologies listed the average breaking strength of the ½ inch diameter 2-in-1 Nystron rope as 10,500 pounds and recommended the maximum working load not exceed 20 percent of the breaking strength, which would be 2,100 pounds. Personnel at Calvary Coal Company stated that they were not aware of the rope being replaced since they had taken delivery of the aerial bucket truck. Jackson Energy Company (first owner of the aerial bucket truck) was contacted to determine if they had replaced the jib crane rope in the more than nine years they had owned the aerial bucket truck. Personnel from Jackson Energy Company stated the rope had been replaced several times, but they did not have a record of the rope type or date that it was last replaced. Jackson Energy personnel stated they purchased all ropes for their aerial bucket trucks from either Terex Utility South or George Products. Terex Utility South personnel were contacted and they stated that they had no records of selling Jackson Energy Company a rope constructed like the rope on the machine at the time of the accident. George Products stated they had sold a rope, with the same construction as the rope on the truck at the time of the accident, to Jackson

Energy Company in December of 1998. This rope was a ½ inch diameter Double Esterlon rope manufactured by Yale Cordage. George Products purchased the rope from Yale Cordage and braided the Double Esterlon rope around a thimble to fabricate the rope sent to Jackson Energy Company. This rope was white with two double green strands weaved into the outer covering. After the thimble was attached an orange coating was applied to the first eight feet of the thimble end of the rope. Information received from Yale Cordage stated the average breaking strength of the ½ inch diameter Double Esterlon rope is 10,500 pounds and the maximum recommended working load was 2,625 pounds. Visual examination of the 8 feet section of rope removed from the jib crane did not reveal either the blue strand of the 2-in-1 Nystron rope or the green strands in the Double Esterlon rope. The rope manufacturers stated the orange coating or the grease and dirt on the rope may have combined with the dye in the colored strands making them unrecognizable.

4) RIGGING: The rope was attached to the top beam of the framework being lifted by wrapping the rope around the beam and putting it through the hook on the end of the rope. When the rope is being used in this way the rope itself is being used as a sling. According to ANSI Standard B30.9, this type of rigging, which is called a choker hitch, reduces the recommended working capacity of the sling by 20 percent. The rope was run through the hook close to the top of the beam. According to ANSI Standard B30.9, using a chocker hitch with the rope hooked close to the load reduces the recommended working capacity of the sling by an additional 20 percent. When a rope is wrapped around a load with a sharp edge, such as the beam the rope was attached to during the accident, proper rigging procedures recommend a protective barrier be placed between the rope and sharp edge to protect the rope from being damaged by the sharp corner. No evidence of a protective barrier was found, indicating that a protective barrier was not used at the time of the accident.

The beam the rope was placed around at the time of the accident was a 5 inch wide flange beam with a weight of approximately 15 pounds per linear foot. The flange on this beam was approximately ¼ inch thick. During the accident, the rope failed were the rope wrapped around the bottom corner of the beam farthest from the aerial bucket truck. The edge of the flange of the beam was bent upward approximately ¼ inch in the area where the rope was attached to the beam.

5) HYDRAULIC SYSTEM: The functions of the aerial bucket assembly are hydraulically driven. The hydraulic pressure is supplied by a single section gear pump driven by the PTO on the truck chassis. All of the hydraulic functions were controlled by manually operated hydraulic control valves with the activating handles attached directly to the valves. There were hydraulic controls located in four separate locations on the aerial bucket assembly. Controls that operate the boom and the jib crane were located at the left bucket when looking toward the rear of the boom truck. Additional controls that operate the boom were located where the boom attaches to the bed of the aerial bucket truck so the boom could be operated from the bed level. The aerial bucket assembly had four outriggers, two located on each side. There were two sets of ground level controls

for the outriggers on the aerial bucket assembly. These controls were located so the operator could see the outriggers while they were being extended.

All of the hydraulic functions on aerial bucket assembly were checked by operating the controls at all four control locations. No defects were found in the operation of the hydraulic functions.

There were two sets of hydraulic cylinders for raising and lowering the boom assemblies. One set of cylinders controlled the lower boom and the other set controlled the upper boom. Each of the cylinders had load holding valves to prevent the boom from dropping in case of the failure of a hydraulic valve or hose. The load holding valves were tested by raising the boom and operating the boom control valves located at the bottom of the boom with the truck engine shut off. The boom did not lower, showing that the load holding valves were holding the cylinders in place.

6) SAFETY BELTS: The operator was not wearing a safety belt at the time of the accident. A lanyard was provided in each of the buckets for attachment of a safety belt. The operator's manual stated that a safety belt should be used at all times when operating the bucket truck from the bucket. As a reference, the OSHA rules and regulations for operation of aerial devices, which were included in the operator's manual, also stated a safety belt should be used at all times.

ROOT CAUSE ANALYSIS

A root cause analysis was conducted. The following causal factors were identified.

Causal Factor: A suitable hitch or sling was not used to lift the steel I-beam structure.

Corrective Action: Mine Management should issue policy that ensures the use of a suitable hitch or sling when lifting heavy loads.

Causal Factor: A safety belt or harness was not used while operating the aerial bucket.

Corrective Action: Policies and procedures should be enforced to ensure that employees use safety equipment.

Causal Factor: The aerial bucket was used to lift a load which exceeded its rated capacity.

Corrective Action: Mine Management should issue policy that equipment be used only in accordance with manufacturer's suggested recommendations.

CONCLUSION

The fatality occurred because the aerial device was used to lift a load which exceeded its capacity. The load rating chart (located on the bucket control console) was illegible. The rope used to lift the load was attached without a suitable hitch or sling. A safety belt or harness was not used to keep the victim from falling from the aerial bucket.

ENFORCEMENT

Order No. 4720637 was issued on June 9, 2003, under the provisions of section 103 (k) of the Mine Act.

A serious accident has occurred on the surface area of the mine, where a miner was operating a boom truck, to dismantle a substation, when the rope apparently broke, allowing the structure of the substation to strike the boom truck. This order is issued to assure the safety of all persons at this accident scene until an investigation has been conducted by MSHA to assure the area is safe to return to normal operations.

104(d) (1) Citation No. 7541895 was issued to Calvary Coal Co. Inc., citing a violation of 30 CFR 77.1710 (g):

The operator of the mine failed to require employees who were raised in the aerial bucket to wear safety belts or harnesses. The mine manager, victim, was not required to wear a safety belt or harness when, on June 9, 2003, he was in the Simon Telelect aerial bucket, S/N T4000-1006 CY. The mine manager was thrown from the bucket from a height of approximately 29 feet when the winch rope on the arm of the aerial bucket broke and jarred the bucket and its support arm. As a result, the mine manager fell to his death. Other employees of the operator had been in the bucket of this truck on prior occasions and were not required to wear a safety belt or harness when the bucket was in a raised position. The bucket truck was operated in the surface area of an underground coal mine.

104(d) (1) Order No. 7541896 was issued to Calvary Coal Co. Inc., citing a violation of 30 CFR 77.210(a)

The mine manager, victim, failed to use a suitable hitch or sling when vertically hoisting/lifting a 4,016 lb. steel structure. He placed a nylon winch rope, once, around the steel I-beam and hooked it back around itself with a metal hook. When he hoisted the structure, the rope failed at the edge of the I-beam throwing the victim out of the hoist, resulting in fatal injuries.

104(d) (1) Order No. 7541897 was issued to Calvary Coal Co. Inc., citing a violation of 30 CFR 77.404 (a):

The Simon Telelect aerial bucket, S/N T4000-1006 CY, was used to lift a load which exceeded it's rated capacity. The mine manager, victim, attempted to lift a large steel structure which weighed 4,016 lbs. which exceeded the lifting capacity of this aerial bucket which is 700 lbs. The operator's manual, located in the cab of this equipment, shows the load lifting capacities of the aerial bucket. A fatal accident occurred as a result of failure of an integral part of the system.

APPENDIX A

Persons Participating in the Investigation

Calvary Coal Co. Inc.

Randy Roberts…….Superintendent
Rick Sandlin……Safety Director

Kentucky Department of Mines and Minerals
Tracy Stumbo……Chief Accident Investigator
Johnny Green……Deputy Chief Accident Investigator
Dill Finley…… Mine Inspector
Gene Adams……..Surface Mine Safety Analyst
Mike Partin……Electrical Inspector
Eugene Hollis……Roof Control Specialist

Mine Safety and Health Administration
William B. Johnson……Mine Safety and Health Supervisor
Arthur V. Smith…… .Mine Safety and Health Inspector
Lester Cox……..Mine Safety and Health Inspector
Charles L. Barton…… Mine Safety and Health Inspector
Foster Brock Jr. …….Electrical Mine Safety and Health Inspector
James Hackworth…… Educational Field Services
Eugene D. Hennen…… ..Mechanical Engineer (Technical Support)
Mary Sue Taylor…… .Attorney

APPENDIX B

Persons Interviewed

Calvary Coal Co. Inc.

Denver Sizemore……Mechanic/Welder
Jeff Sizemore……..Front-End Loader Operator
David Roberts…….Repairman/Electrician
Rick Sandlin……Safety Director