

Construction Materials Technician Electrocuted After Contacting Power Line at Quarry

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Summary

On August 14, 2001, an 18-year-old male construction materials technician (the victim) died after contacting an energized power line while operating an all-terrain vehicle. The victim was a quality assurance technician at a rock quarry. The quarry site was also used to process, test, and stockpile materials for the nearby road construction project. At the time of the incident, the victim was riding the all-terrain vehicle for purposes other than assigned duties. While cresting one of several piles of crushed rock, the vehicle was stopped or became stuck in the soft material. Approximately 6 feet above the victim's location was a 14,400-volt power line. The incident was not witnessed, and it was surmised from the evidence that the victim stood on the vehicle's foot pedals. The energized power line contacted his back.

A co-worker discovered the victim and alerted several other workers in the area. The victim was left in place on the vehicle until he could be safely removed from the vehicle and moved away from the broken power line, which had burned in half and was lying near the location. A supervisor called 911. State troopers, electric utility personnel, and emergency medical service personnel were dispatched. The victim was declared dead at the scene.

Based on the findings of the investigation, to prevent similar occurrences, employers should:

- **Ensure that storage sites for all construction materials are inspected for potential hazards under, at, and above ground levels prior to beginning processing (crushing and storage) operation;**
- **Maintain a minimum 10-foot safety zone near all power lines;**
- **Develop a written comprehensive safety program that includes job hazard analyses;**
- **Ensure all workers are given initial hire safety and health orientation that encompasses their duties and general worksite safety and that they are able to recognize and avoid hazardous situations.**

In addition, employers should:

- **Ensure that workers are knowledgeable of proper emergency response actions when responding to a medical emergency or an injury scene near downed power lines and should never assume downed power lines and surrounding ground are de-energized.**

Introduction

At approximately 10:00 PM, on August 14, 2001, an 18 year-old male construction materials technician (the victim) was found electrocuted on top of a large mound of crushed rock. On August 15, 2001, the Alaska Department of Labor and Workforce Development (AKDOLWD) notified the Alaska Division of Public Health, Section of Epidemiology. An investigation involving an Injury Prevention Specialist for the Alaska Department of Health and Social Services, Section of Epidemiology ensued on the same day. The incident was reviewed with company safety and supervisory representatives, AKDOLWD officials, Alaska State Troopers, and Alaska Medical Examiner.

The company in this incident was a road construction and paving business. It had been in business for 30 years but had been purchased in 2000 by an international corporation. The company had 200 employees, of which 65 employees worked at the incident site. In June 2001, the company began work on a federally funded road improvement project. As part of the project

specification, the company conducted gradation testing of roadbed materials to assure that appropriate sized rock and gravel was used during various phases of road construction. The company employed three quality assurance technicians to test the grade of material from their rock crushing operation. The road improvement project ran 24 hours per day, two 12-hour shifts, 6 days a week. The victim had been employed as a quality assurance technician for approximately 2 months, of which the last 2 ½ weeks were at the quarry site.

The company had a written safety and health plan that summarized the supervisors' responsibilities, general safety rules, vehicle safety, and company policy on safety and substance abuse. All new employees attended an orientation to the company's safety program upon initial hire and were given a packet containing copies of the aforementioned materials. The company held weekly safety meetings and held additional safety meetings as needed. This was the first fatal injury for the company.

Investigation

The incident site was a quarry leased to the company by a private property owner. The quarry was located near the road improvement project, allowing timely access to road materials as needed. The company excavated, crushed, tested, and stockpiled roadbed materials on-site. The quarry was accessible by an unimproved road from a two-lane highway. The terrain at the incident site was flat except for large mounds of rock and gravel. Weather at the time of the incident was reported as dry and was not considered a factor. Natural light conditions were twilight with no artificial light; light conditions were considered to be a factor in this incident.

The majority of the stockpiled materials, large mounds of grade crushed rock and gravel, were located at the front of the quarry. In addition to the stockpiled materials, the quarry area contained a crusher, several trailers (including the testing trailer), and heavy equipment. An all-terrain vehicle and several pick-up trucks were kept at the site for employee use to travel and collect samples of processed materials. All pick-up trucks contained a first aid kit and fire extinguisher. The all-terrain vehicle was stored behind the trailers near the pit area. The key was kept in the vehicle's ignition.

Energized power lines ran adjacent and crossed over into areas of the 10-mile road improvement projects. Height above the ground varied with terrain and sag in the lines between support poles. A power line also ran through the quarry area. The energized line was a 14,400-volt, single-phase to ground power line, providing needed power for the crusher, testing trailer, and lights and other equipment

The crusher was operative during two 10-hour production shifts with two 2-hours of down time between shifts for maintenance. Operation was 6 days per week. Excavated rock was brought to the crusher where it was crushed, screened, and graded. This material was carried from the crusher by conveyor belt to a stockpile site. Approximately 600-1000 pounds of material could be produced per shift.

The construction materials technicians were responsible for assuring the rock grade produced by the crusher was within specifications. As part of their duties, the technicians would use a pick-up truck to collect a sample of crush rock and return to the trailer for gradation testing. Complete analysis took 1-1 ½ hours. The specification analysis information was then reported to the crusher foreman who would make any necessary adjustment to the crusher.

Days prior to the incident, the crusher and lights had been moved to an area near the power line traversing the quarry. While the crushing operation crew tried to pile the material on either side of the power line, a large mound had accumulated with an apex 6 feet below the line. On the day of the incident, the crusher and lights were again moved to another area; the crusher was switched over to produce a different gradation of product. It was noted at that time that the mound might have been within 10 feet of the power line. It was discussed whether to move some of the material, however alternate locations were not feasible at that time. The height of the mound may have been due to poor lighting conditions during the evening shifts.

Due to the victim's limited time on the job, the victim's co-worker had an overlapping shift to assist with the analysis for the next product; the victim would give the results to the foreman (the crusher operator). On the night of the incident, the victim had collected another sample and had begun drying it. Normal sampling procedure is to collect from three areas: base, middle, and top.

Occasionally, the technicians also took the all-terrain vehicle to the pit area to make sure that the material being crushed was the same as the previous load. The victim had been at work for approximately 3 hours. Since samples need to be dried prior to testing, he was last seen on a break, sitting in his pick-up truck listening to the radio. However, the victim had been seen on previous workdays riding the all-terrain vehicle in the pit area and had also been seen riding on the stockpiles.

As the co-worker was working in the trailer, he noticed a power fluctuation and unusual odor. Going outside, he saw fire and smoke on top of the mound. He drove to the mound in a pickup truck, yelled to co-workers to call 911. He found the victim on an all-terrain vehicle and used the fire extinguisher to put out fire around the vehicle.

The foreman arrived to assess the scene. He surmised that the victim had been electrocuted and sustained extensive burns. The victim was seated on the still running all-terrain vehicle; the power line had burn in half and was on the ground near the vehicle. At least one end of the line was still energized (indicated by the sparks). After cautioning everyone to stay away, the foreman attempted to push the victim from the vehicle but received a shock from the victim's body. Seeing that the lines were not contacting the vehicle, he touched it and was not shocked. Since the vehicle was not energized, he then turned off the ignition. A PVC pipe was used to push the victim off the vehicle. By this time, emergency medical service personnel arrived and confirmed that the victim had died at the scene.

Cause of Death

The Medical Examiner's report listed the cause of death as electrocution.

Recommendations

Recommendation #1: Employers should ensure that storage sites for all construction materials are inspected for potential hazards under, at, and above ground levels prior to beginning processing (crushing and storage) operation.

Discussion: In this incident, the workers thought that the location in the quarry, stockpiling procedure, and the distance from the power line was "adequate." Although the stockpiled

material was initially being deposited to either side of the power line, it eventually merged into one large mound with an apex well into the mandatory 10-foot safety zone of energized power lines. Inspection of the work area should be done at the beginning of every shift. The inspection must be done by a person who is 1) capable of identifying existing and predictable hazards at the work area or working conditions that are hazardous or dangerous, and 2) authorized to make prompt corrective actions.

Recommendation #2: Employers should maintain a minimum 10-foot safety zone near all power lines.

Discussion: While this incident involved an all-terrain vehicle operator, the potential for injury could have involved any personnel who could not maintain continuous sight of the energized power line. Ten feet of clearance has been the American standard for work near energized power sources, however employers should consider mandating a 20-foot safety zone since sag in the line can vary day to day due to such factors as ambient temperature. This extended safety zone has been adopted by many American and Canadian professional trade groups, operating engineer associations, and equipment manufacturers. Although the height of the power lines above the mound may not have been known, recognition of a potential hazard and immediate action would have prevented the incident.

Recommendation #3: Employers should develop a written comprehensive safety program that includes job hazard analyses.

Discussion: A comprehensive safety program should identify and reduce or eliminate worker exposure to hazardous situations and provide proper training to help workers do their job safely and efficiently. Employers should review each job or task to determine the extent and significance of work site and equipment hazards and consider the types of safety precautions promote safe work practices.

Employers should also consider conducting random work site safety inspections to evaluate compliance with and understanding of established safety policies and practices. While employees have the right to question the safety of any task, they are responsible for following the practices outlined by their employer's safety program. In addition to specific safe practices,

steps should be outlined and discussed with employees for noncompliance with an established safety program.

Recommendation #4: Employers should ensure all workers are given initial hire safety and health orientation that encompasses their duties and general worksite safety and that they are able to recognize and avoid hazardous situations.

Discussion: In this incident, new hire employees were given a safety orientation and copies of the written safety rules and company safety policy and practices. However, the materials did not address specific practices of individual positions, such as use of all-terrain vehicles at the worksite. It would be helpful to both the employee and the employee's supervisor to use a position specific orientation checklist to ensure that unsafe activities are avoided.

Recommendation #5: Employers should ensure that workers are knowledgeable of proper emergency response actions when responding to a medical emergency or an injury scene near downed power lines and should never assume downed power lines and surrounding ground are de-energized.

Discussion: While basic skill in first aid and life support can reduce suffering and introduce measures to retard degenerative health condition(s) of a seriously injured person, hazards due to a nearby energy source may cause injury or death to persons attempting to render aid.

Responders must always assess the scene first to identify any hazards to themselves and the victim. Never use touch to determine whether a person or equipment is energized.

Workers should also be made aware that a power line might only be temporarily de-energized due to a sensor switch that opens immediately following an incident to a line. Automatic reclosure mechanisms at nearby power stations may attempt to re-energize line. In addition, electrical charge from power lines lying on the ground (either intact, broken, or burned) can potentially travel through the ground, causing shock and injury. Until the energy source has been confirmed as isolated or de-energized, a 10-foot safety zone should be maintained to prevent additional injuries.

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Fatality Assessment and Control Evaluation (FACE) Project

The Alaska Division of Public Health, Section of Epidemiology performs Fatality Assessment and Control Evaluation (FACE) investigations through a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR). The goal of these evaluations is to prevent fatal work injuries in the future by studying the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

Additional information regarding this report is available from:

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