

Driller's helper electrocuted when mast of drill rig contacted overhead power lines

FACE 99-AK-019

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SUMMARY

On June 17, 1999, a 32-year-old male drill truck operator's helper (the victim) was electrocuted when the mast of a drill rig contacted two-7,200-volt overhead power lines. The victim was assisting a drill rig operator to drill for a local environmental engineering contractor. They had relocated the truck to the front of an industrial lot to drill the last hole. A small flag indicating the well's position marked the location. The marker was near a fence separating the lot from an adjacent road. Above the marker were four power lines that ran parallel to the road. After extending the truck's front outrigger, the operator began raising the drill rig mast to position it over the marker. The victim was standing near the rear of the driver's side of the truck unloading equipment when the mast contacted the high voltage power line. Two workers employed by the contractor were standing several feet from the driver's side of the truck and heard a noise. They saw the victim and the operator frozen to and then collapse away from the truck. One worker went into a nearby building to call 911 as the other worker went to check both men. A worker from the building and a passerby arrived at the site as the first worker returned. Two teams were coordinated and CPR was started on the victim and operator. Emergency medical services arrived minutes later. The victim and the operator were transported to a nearby medical center where the victim was pronounced dead. The operator survived, but was unable to recall details of the incident.

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

- Ensure that a hazard assessment has been completed to identify all hazardous conditions that may affect operation of equipment;

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- Ensure that equipment is not operated where any part is within 20 feet of electric power lines unless the lines have been de-energized and either grounded or insulation barriers have been installed;
- Ensure that a safety checklist is included in the written standard operating procedures (SOP) and is used prior to the start of any drill activity for each work site;

In addition, all companies responsible for marking drill sites should:

- Maintain a minimum 20-foot safety zone and be knowledgeable of all applicable OSHA requirements for work near utilities and electric power supplies;
- Communicate to all parties involved in drilling activities the location of both above and below ground utility and electric power supplies near a drill marker that are within a distance equal to the height or extension of the drill equipment plus 20 feet.

To help prevent or reduce the severity of injury in emergency situations, all drill rig owners and operators should:

- Ensure that all operator's controls are in good working condition and are clearly labeled.

INTRODUCTION

At approximately 2:00 PM on June 17, 1999, a 32-year-old driller's helper (the victim) was electrocuted when the mast of a drill truck contacted two-7,200-volt overhead power lines. On June 18, 1999, Alaska Department of Labor (AKDOL) 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 June 18, 1999. An on-site investigation was conducted on June 21, 1999. The incident was reviewed with AKDOL officials and the company owner. [It should be noted that due to injuries from the

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incident, the owner could not remember events proceeding, during, and following the incident.] Local police department, Alaska Medical Examiner, and AKDOL reports were requested.

The drilling operation in the incident was privately owned and operated. The company had been in business for approximately 10 years. The operator/owner had 25 years of drilling experience and was currently the sole drill operator (henceforth referred to as “the operator”). Normally, the company employed one permanent full-time helper to assist the operator in the shop and at drill sites; however, the company would employ one or more helpers and an additional operator depending on the work schedule and a project’s specifications and timeline.

The victim had worked for the company for approximately 1½ years as a driller’s helper and was training to become an operator. As a driller’s helper, his responsibilities included driving the drill rig to and from a work site, equipment set-up (except raising the mast and leveling the drill rig), and facilitating drilling activities by retrieving and removing materials and supplies. In addition to these activities, as a trainee, the victim was taught drilling mechanics, general rock formations and characteristics, and use of the controls under the supervision of the operator. The day prior to the incident, the victim had operated the controls of the drill while being supervised by the operator. The victim was not permitted to operate the controls to raise the mast.

The company did not have a written safety program. Prior to drilling, the operator conducted daily tailgate or site specific safety meetings. During the tailgate safety meetings, any representatives or employees of a contractor working with the company during drilling operations were included. Topics usually included safe working practices, emergency stop procedures, and potential work site hazards. It could not be determined if a tailgate meeting was conducted between the operator and the victim; no records of these meetings were kept. However, tailgate meetings were a common practice during previous drill activities performed for this contractor.

The contractor involved in this incident was an environmental engineering agency with nearly 700 employees nationwide; 10 employees were on-staff at the incident location. The contractor

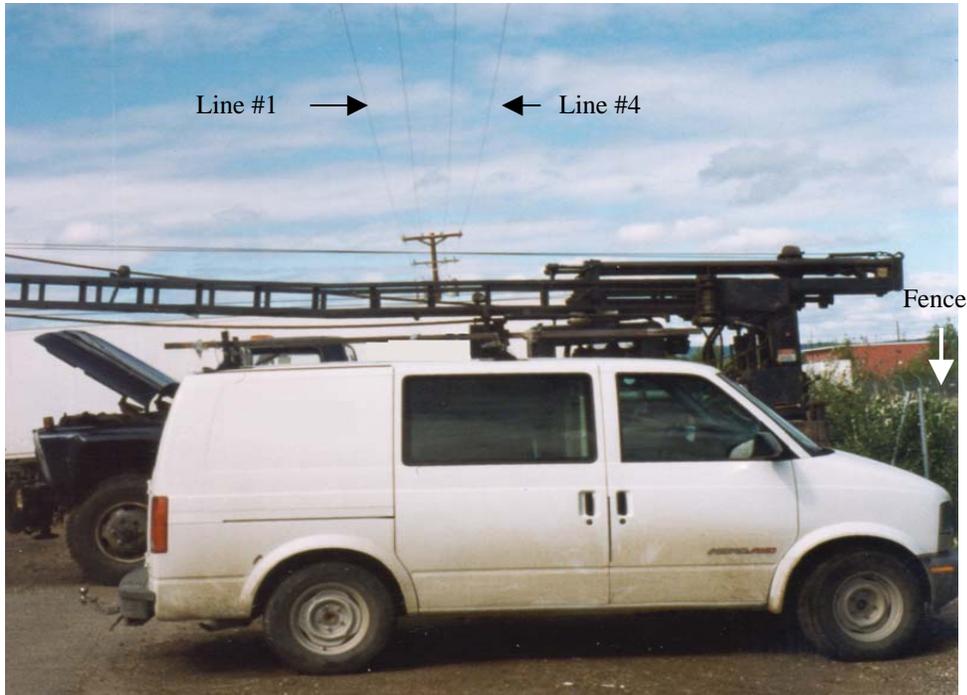
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had engaged the company for several projects during the 4 years prior to the incident. The contractor had a written safety program that included drill rig safety and personnel safety for its employees who were required to work with drilling companies.

INVESTIGATION

The company was engaged by the contractor to drill three monitoring wells for the placement of equipment to collect ground water data. The incident site was an industrial lot at the corner of two unpaved roads. Two buildings were on the lot. The lot surface consisted of compacted dirt, crushed rock, and gravel. A ditch and a 6-foot chain-link fence separated the front of the lot from the road. The fence continued around the perimeter of the lot. Access to the lot was over a culvert and through an 18-foot chain link gate. An electric utility easement was located along the front of the lot parallel with the road. Poles supporting four lines were located outside of the lot; the nearest utility pole was near the intersection of the two roads. The power lines were parallel to the road, and all lines (#1, #2, #3, and #4) traversed above the lot. Lines #1, #3, and #4 were energized to 7,200 volts; line #2 was neutral. A crossbeam with 3-foot spacing between lines supported the lines. The horizontal distance from line #4 (closest to the road) to the fence was approximately 11 1/2 feet (Figure 1). Weather may have been a contributing factor at the time of the incident; reduced visibility from rain and mild mist was reported. The lot surface was very wet with some puddling of water.

Figure 1. Location of van and drill rig under overhead power lines



The equipment involved in the incident was a 1979 auger (mechanical rotary drill) mounted to a truck bed (Figure 2a and 2b). The truck was equipped with three outriggers: one at the front, mid-distance from both side; and two at the rear. The master derrick (or mast) was approximately 27 feet long with a maximum vertical rotation of 90 degrees from a rear pivot point 3½ feet from the end of the mast. The mast's pivot point was 8 feet above ground level. The height of the mast when fully raised was 31½ feet. All mast, drill, and pump controls were located at the rear of the truck. The control panel was in poor condition with worn and weathered labels (Figure 2c). An operator's platform consisted of a small metal grate attached to the rear of the truck below the control panel (Figure 2d).

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Figure 2a. View of drill rig, front driver's side



Figure 2b. View of drill rig, passenger side



Figure 2c. Control Panel



Figure 2d. Control Panel and operator's platform



The procedure normally used by the drill operator and helper for setting-up the drill rig was as follows--

- 1) Extend and lower the front outrigger;
- 2) Raise the mast into position;
- 3) Extend and lower the rear outriggers;

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- 4) Attach drill steel;
- 5) Check the drill rig stability (using Kelly bar) and level using the rear outriggers.

On the day of the incident, the company was drilling three monitoring wells. The company was responsible for drilling the holes, installing casing, and the sand pack. The contractor was responsible for requesting utility locations, marking the locations of the wells, and the collection of samples. Two employees of the contractor were working with the drill company to assure proper location of the wells, answer questions about a well location, and collect and process samples. Normally, only one employee of the contractor worked at the drill site; however, during this project, a second, more experienced employee was assisting due to the limited drill experience of the first. The employees had discussed proposed drill locations with the project manager and underground utility locates were done. The first two well locations were at the back of the lot and marked with flags. Neither employee was aware of the precise location of the third flag at the front of the lot until the day of the incident. Due to potential interference with a underground electric hook-up from the electric meter to one of the two buildings, the project manager placed the third flag after discussing the location with building occupants. [Secondary underground electric utility locates (past the meter's location) are not done by public utilities. A private electrical contractor must be hired to perform these locates.]

Drilling was briefly delayed due to the late arrival of the drill rig, but the activity was still on schedule. No other delays or problems had occurred while drilling the first two holes at the back of the lot. The truck was relocated to the front of the lot to drill the last hole. The marker was by the fence at the edge of the lot, and the truck was backed into position under the overhead power lines. The truck was parked at a 90-degree angle (perpendicular) to the fence and the power lines. The back of the truck was 7 feet from the fence. The distance from the ground (at the truck's location) to the overhead lines was 31 feet. A van owned by the contractor was parked parallel to the truck, approximately 12 feet from the truck's driver side.

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The contractor's employees (the witnesses) were standing near the gate, several feet from the van, discussing the location of the marker near the fence and potential involvement of underground utilities. The victim was removing equipment from the driver's side of the truck while the operator stood at the control panel at the rear of the truck. The front outrigger was extended and lowered. Neither of the witnesses was aware of the operator's activities and did not see the mast rise. The top of the mast rose between line #2 and #3, pushed line #3 toward the street, and contacted line #4. At this time, the witnesses heard a loud boom and crackle. Looking toward the drill rig, they saw sparks coming from the truck. Both the victim and the operator were "frozen" to the truck and then fell away from it toward the van. One witness instructed the other to go into a nearby building and call 911. Upon her return, two more people, both trained in first aid and CPR, joined them. They moved the victim and the operator to the other side of the van. CPR was started on both the victim and the drill rig operator. Emergency medical service personnel were dispatched at 2:05 PM, arriving at the site approximately 5 minutes later and continued CPR. The victim and the operator were transported to a nearby medical center where the victim was pronounced dead. The operator survived the event and was discharged 4 days later.

CAUSE OF DEATH

The medical examiner's report listed the cause of death as high voltage electrocution.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should ensure that a hazard assessment has been completed to identify all hazardous conditions that may affect operation of equipment.

Discussion: In this case, the operator apparently did not consider the height of the mast when assessing for hazards during operation of the drill rig. Although the height of the power lines above the drill site marker may not have been known, recognition of a potential hazard would have prevented the incident.

Recommendation #2: Employers should ensure that equipment is not operated where any part is within 20 feet of electric power lines unless the lines have been de-energized and either grounded or insulation barriers have been installed.

Discussion: In accordance with 29 CFR 1926.416(g)(2)(iii)(A), “Any vehicle or mechanical equipment capable of having parts of its structure elevated near energized overhead lines shall be operated so that a clearance of 10 feet is maintained.” While the truck was more than 20 feet below the overhead power lines, the mast entered the safety zone as it raised to a vertical position. Operators should maintain continuous sight of all potentially energized power sources when raising the mast to a vertical position. Employers should consider mandating a 20-foot safety zone; this has been adopted by many American and Canadian equipment manufacturers, professional trade groups, and operating engineer associations.

Recommendation #3: Employers should ensure that a safety checklist is included in the written standard operating procedures (SOP) and is used prior to the start of any drill activity for each work site.

Discussion: In this incident, workers either were not aware of or thought that the overhead power lines were an “adequate” distance from the drill rig. Overhead power lines and other potentially harmful conditions (e.g., pipe or rebar protruding from the ground) are not marked on the ground during locates. A person who is capable of identifying existing and predictable hazards at the work area or working conditions that are hazardous or dangerous must do a visual inspection of the work area prior to the start of all drilling activities. A site inspection checklist is an effective assessment tool to ensure that unsafe activities are avoided.

Recommendation #4: Companies responsible for selecting and marking drill sites should maintain a minimum 20-foot safety zone around utilities and electric power supplies and be knowledgeable of all applicable OSHA requirements for work near utilities and electric power supplies.

Discussion: To minimize the possibility of utility and electric power supply involvement at a work site, companies should develop and implement guidelines for marking drill sites that include potential hazards and possible alternatives and solutions for drill site selection when within 20 feet of utilities or electric power lines. Guidelines should emphasize a **20-foot safety zone around the utility or electric power supply**; additional space or clearance may be necessary to maintain a safety zone when equipment is raised.

Recommendation #5: Companies responsible for selecting and marking drill sites should communicate to all parties involved in drilling activities the location of both above and below ground utility and electric power supplies near a drill marker that are within a distance equal to the height or extension of the drill equipment plus 20 feet.

Discussion: The ability to communicate is crucial to safe work practices. Regardless of personal interpretation of how apparent or significant a hazard may be, information about **all** potential hazards and dangers at a work site should be communicated to workers.

In addition, to help prevent or reduce the severity of injury in emergency situations:

Recommendation #6: Drill rig owners and operators should ensure that all operator controls are in good working condition and are clearly labeled.

Discussion: Manufacturers recognized the increased risk for fatal injury when operator controls are not clearly labeled. Employers should ensure that all operator controls are clearly labeled before placing equipment in use. In the event of an emergency, basic operation or an emergency stop can be done.

REFERENCES

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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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