PUBLIC HEALTH SERVICE/CDC/NIOSH/DSR
FACE-92-12
DATE: September 16, 1992

TO: **Director, National Institute for Occupational Safety and Health**

FROM: **Division of Safety Research, NIOSH**

SUBJECT: **Powerline Worker Electrocuted While Performing Maintenance on Overhead Powerline - Alaska**

SUMMARY

A 37-year-old male electric utility powerline worker (the victim) was electrocuted while performing maintenance on a 7200-volt overhead powerline. The victim had been assigned by the electric utility to investigate and repair a problem involving intermittent power outages in a rural community. Two weeks before the incident, the victim isolated and replaced what he thought was the outage problem (an arcing electric service line) at a utility pole near a school. On the day of the incident the victim climbed the utility pole to adjust the primary phase jumper cable, which he apparently thought was another probable arcing source. He was not wearing his lineman gloves, or his protective helmet. At the moment of the incident, the victim had his left climbing boot gaff planted in the utility pole, his right climbing boot in contact with the pole guy wire, and his left arm/hand resting on the neutral phase. Thinking (presumably) that the powerline had been de-energized, the victim grabbed the energized primary phase jumper cable with his right hand. In doing so, he provided a path to ground (the electric current entered his right hand, and exited his left arm/hand and right foot), and the victim was electrocuted. The forensic pathologist stated in his report that the victim's judgement was probably impaired by the influence of marijuana which the victim may have used shortly before the incident. NIOSH and the Alaska Department of Health and Social Services investigators determined that in order to prevent future similar occurrences, employers should:

- *implement measures to help ensure that powerline workers are free from the use of controlled substances, especially while on the job*
- *ensure that all workers who perform maintenance on overhead powerlines are properly trained in safe work procedures*
- *ensure that powerline workers follow State regulations and safe work procedures established by the electric utility industry*
- *ensure that powerline workers use all appropriate personal protective equipment before working on powerlines with energized circuits*
- *ensure that a comprehensive safety program which includes specific written procedures for all work near energized powerlines, is designed, developed and implemented.*

Additionally, the Alaska State Legislature should:

- *consider an amendment to Statute AS 18.62.010, to ensure that all hazardous powerline work is performed by or under the direction of qualified workers.*

INTRODUCTION

On December 28, 1991, a 37-year-old male electric utility powerline worker (the victim) was electrocuted while performing maintenance on a 7200-volt overhead powerline. The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research, Alaska Activity began tracking this incident after it was initially reported in local newspapers on December 30, 1991. An investigation was initiated on this date, involving a safety specialist from the Alaska Activity and an injury prevention specialist candidate from the State of Alaska, Department of Health and Social Services, Division of Public Health, Section of Epidemiology. The incident was reviewed with the compliance officer assigned to this case from the State of Alaska, Department of Occupational Safety and Health (AKOSH), and a representative of the electric utility company. An investigation of the incident site was conducted, and photographs and reports were obtained from AKOSH, police, and the medical examiner.

The employer was a rural electric company that had been in operation for 32 years. The company had 52 employees, including 9 powerline workers. The company had a safety policy, safety program, and basic written safe work procedures. A company management official (company representative) was assigned as the safety manager as a collateral duty, and employee safety meetings were conducted on a weekly basis. The victim had worked for this employer for 6 weeks as a powerline worker, and did not have any previous powerline work experience or training.

INVESTIGATION

The victim had been assigned by the electric utility company (approximately 2 weeks before the incident) to investigate and repair a problem involving intermittent power outages at an elementary school in a rural community. The victim isolated and replaced what he thought was the outage problem (an arcing service line) at a utility pole near the school.

One day before the incident, the victim returned to the rural community to repair and replace several other electric service lines in the area. He was assisted by two local village laborers (co-workers) who had been hired by the electric utility on an as-needed basis. Before performing the maintenance work, the victim de-energized each electric service line by opening its corresponding cut-out fuse with a hot stick (a fiberglass pole, typically used for switching electrical circuits). However, he failed to “ground the line” by temporarily splicing a jumper cable between the primary phase and the neutral phase, as required by written company procedures.

At about 3 p.m. on the day of the incident, the victim phoned the on-duty supervisor of the company, and told him that he had completed the assigned repair work. Although the victim had met and conversed with the on-duty supervisor on several previous occasions, the on-duty

supervisor was unable to convince the victim that they knew each other; he further commented that the victim seemed "out of it" on the phone. After the phone call, the victim returned to the utility pole near the school (where he had replaced the electric service line two weeks previously). According to the co-workers who were standing nearby, the victim apparently noticed another possible cause for the intermittent power outages that could develop between the primary phase jumper cable and the neutral phase, during windy conditions. Presumably, in an attempt to shorten or relocate the primary phase jumper cable, the victim climbed the utility pole. At this time he was wearing leather work gloves, but not his lineman gloves nor his protective helmet; the victim had left this personal protective equipment, hot stick, and other equipment at another location about 5 miles away. Although the two co-workers did not observe the victim at the moment of the incident, a resident, who was approximately 100 feet away, witnessed the entire incident from a window in his house. At the moment of the incident (about 3:30 p.m.), the victim had his left climbing boot gaff planted in the pole, his right boot in contact with the top of the guy wire, and his left arm and hand resting on the neutral phase (Figure). Presumably unaware that the powerline had not been de-energized at the cut-out fuse, the victim grabbed the primary phase jumper cable providing a path to ground (burn marks suggest the electric current entered his right hand, and exited his left arm/hand and right foot). and the victim was electrocuted. The two co-workers looked up at the victim after hearing "a burning sound," and saw sparks coming out of his right hand, and smoke coming out of his right leg.

One of the co-workers went to the school and yelled for help. The village police officer and two community health aids arrived at the scene in about 10 minutes. They found the victim unresponsive and hanging limp from his pole-climbing belt near the top of the utility pole, with his right hand no longer in contact with the primary phase jumper cable. The powerline was de-energized by a telephone line repairman [responding to an emergency call on his citizens band (CB) radio] about 20 minutes after the incident. The telephone line repairman climbed the utility pole, and lowered the victim with a rope. The community health aids administered cardiopulmonary resuscitation (CPR) at the scene, and during snowmobile/sled transport to the community health clinic. One of the community health aids continued CPR at this location, and during air transport to a regional hospital where the victim was pronounced dead on arrival (about 5 p.m.) by the attending physician.

A forensic pathologist at the hospital conducted a drug screen on the victim. His report stated, "The toxicologic screen revealed a level of marijuana and its metabolite which would indicate that he had smoked marijuana approximately thirty to forty-five minutes before his death. The fact that tetrahydrocannabinol, the active agent, was detected in his blood would suggest that he was under its influence and, therefore, his perception of his environment as well as his judgement were impaired."

CAUSE OF DEATH

The medical examiner listed the cause of death as electrocution.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should implement measures to help ensure that powerline workers are free from the use of controlled substances, especially while on the job.

Discussion: According to the forensic pathologist's report, the toxicologic screen showed a level of marijuana in the victim's blood which indicated that he had probably smoked marijuana 30 to 45 minutes before the incident occurred, suggesting that he was under its influence, possibly impairing his judgement and perception. Powerline workers are exposed to significant hazards, even under the most favorable working conditions. Performing work on energized powerlines while under the intoxicating influence of controlled substances (such as marijuana) increases the likelihood for serious injury. Section 111 of the American Public Power Association, Safety Manual for an Electric Utility, states "Use of intoxicating beverages or drugs … on the job or during working hours is prohibited and shall be sufficient cause for disciplinary action." To deal with this problem, some companies have implemented the services of an Employee Assistance Program (EAP), whereby employees can receive free and confidential professional help in resolving personal problems (such as drug abuse). Some Alaskan employers, because of business size or geographic location, may not be inclined to implement an EAP. The manual entitled "Employer's Guide for Developing Employee Assistance in Alaska" has information which may be helpful to supervisors, in the absence of an established EAP.

Recommendation #2: Employers should ensure that all workers who perform maintenance on overhead powerlines are properly trained in safe work procedures.

Discussion: The victim was a powerline maintenance worker with virtually no previous powerline maintenance experience or training. The AKOSH Electrical Code, Section EC 03.009, requires employees who face a risk of electric shock to be "… trained in and familiar with any electrically related safety practices … which are necessary for their safety." Additionally, Section EC 03.010 (c) (2) states, "Only qualified persons may work on electric circuit parts or equipment that have not been de-energized under the procedures of (b) of this subsection. Such persons must be capable of working safely on energized circuits and must be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools."

Recommendation #3: Employers should ensure that powerline workers follow State regulations and safe work procedures established by the electric utility industry.

Discussion: The victim climbed a utility pole to work on an energized line. AKOSH Electrical Code Section EC 03.010 (a) (1) states, "Live parts to which an employee may be exposed must be de-energized before the employee works on or near them …" Section 507 (a) of the American Public Power Association (APPA) Safety Manual for an Electric Utility states, "All conductors and equipment shall be treated as energized until tested or otherwise determined to be de-energized and grounded." A similar requirement is stated in AKOSH Construction Standard CC 05.220 (a) (2) (B).

Recommendation #4: Employers should ensure that powerline workers use all appropriate personal protective equipment before working on powerlines with energized circuits.

Discussion: The victim did not don lineman gloves or a protective helmet before climbing the utility pole to work on an energized powerline. According to Section 502 (a) of the APPA Safety Manual, "Employees shall not touch or work on any exposed energized lines or apparatus except when wearing approved protective equipment approved for the voltage to be contacted. When work is to be done on or near energized lines, all energized and grounded conductors or guy wires within reach of any part of the body while working shall be covered with rubber protective equipment, except that part of the conductor on which the employee is to work." Also, section 504 (d) of the APPA safety manual states that employees shall wear rubber lineman gloves with the leather protectors, under the following conditions: (1) "When working on or within falling or reaching distance of conductors, electrical equipment, or metal surface (crossarms, crossarm braces or transformer cases) which are not effectively grounded and which may be or may become energized." A similar requirement is stated in AKOSH Construction Standard CC 05.220 (a) (3).

Recommendation #5: Employers should ensure that a comprehensive safety program which includes specific written procedures for all work near energized powerlines, is designed, developed and implemented.

Discussion: The company had a safety program with written basic safe work procedures. However, these procedures did not specifically address training, tools, and protective equipment for routine hazardous jobs. Employers should design, develop and implement a comprehensive safety program which includes specific written procedures for all work to be performed on or near energized high voltage powerlines. These procedures should include, but not be limited to:

1. Worker training.
2. Electrical hazard recognition.
3. Proper use and maintenance of personal protective equipment.
4. Supervisory jobsite surveys before starting work.
5. First aid and cardiopulmonary resuscitation (CPR) certification training.

Recommendation #6: The Alaska State Legislature should consider an amendment to Statute AS 18.62.010, to ensure that all hazardous powerline work is performed by or under the direction of qualified workers.

Discussion: For the type of powerline maintenance work the victim was doing, the current Alaska Statute (AS 18.62.010) requires workers to obtain a "certification of fitness," (which requires 4 years or 8,000 hours of powerline work experience) - a prerequisite for taking a written examination to become a journeyman lineman. However, an exemption to this rule is also stated in the same Statute; "… except that a certificate of fitness may not be required of employees of an electric utility which does not have within its service area any portion of a city or unified municipality having more than 2,500 population." Most rural communities of Alaska have a population of less than 2,500; the community where this incident occurred had a population of less than 500. The Alaska State Legislature should therefore consider a change in

this statute, requiring all powerline workers who do this type of powerline work to have a certificate of fitness, or to work under the direct supervision of an employee who either has a certificate of fitness, or who is a journeyman lineman.

REFERENCES

American Public Power Association, Safety Manual for an Electric Utility, 1983.

State of Alaska Alcoholism and Drug Abuse Plan for 1990-1992, Office of Alcoholism and Drug Abuse, April 1990.

Employer's Guide for Developing Employees Assistance in Alaska, Office of Alcoholism and Drug Abuse, 1989.

Electrical Code, Alaska Occupational Safety and Health Standards, July 1991.

Construction Code, Volume I, Alaska Occupational Safety and Health Standards, August, 1990.

Alaska Statute, AS 18.62.010., 1980.

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Fatal Accident Circumstances and Epidemiology (FACE) Project

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and requests technical assistance. 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.

States participating in this study: Alaska, Georgia, Indiana, Kentucky, Maryland, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia.

Additional information regarding this report is available from:

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FACE 92-12