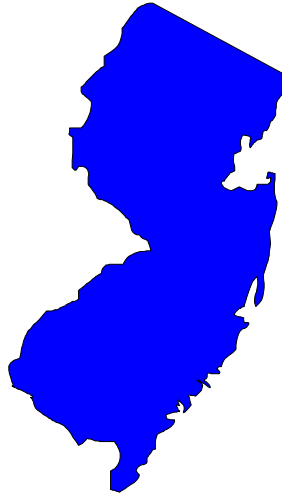


F.A.C.E. INVESTIGATION REPORT

Fatality Assessment and Control Evaluation Project

FACE #94-NJ-072-01

Apprentice Lineman Dies After Making Contact with a High
Voltage Transmission Line Through a Wooden Utility Pole



New Jersey Department of Health and Senior Services
Occupational Disease and Injury Services
P.O. Box 360
Trenton, New Jersey 08625-0360
(609) 984-1863

TO: Division of Safety Research
National Institute for Occupational Safety and Health
Morgantown, West Virginia

FROM: Fatality Assessment and Control Evaluation (FACE) Project
New Jersey Department of Health (NJDOH)

SUBJECT: FACE 94 NJ 072-01
Apprentice Lineman Dies After Making Contact With High
Voltage Transmission Line Through a Wooden Utility Pole

DATE: October 3, 1994

SUMMARY

On May 10, 1994, a 30 year-old male apprentice lineman died when he contacted 69,000 volts of electricity from a transmission power line through a wooden utility pole. He was part of a three-man crew that was setting new utility poles at an electrical substation. NJDOH FACE investigators concluded that, in order to prevent similar incidents in the future, the following safety guidelines should be followed:

- o Maintain an appropriate minimum distance from energized power lines at all times
- o When it may not be possible to maintain the appropriate minimum distance between power lines and equipment, workers should request that lines be deenergized.
- o When setting poles near existing power lines, any worker who may contact the utility pole or power line should be protected with appropriate personal protective equipment.
- o Company representatives who evaluate work sites should consider both the work needed and safety hazards in the area.
- o The work area should be clear of vehicles or other obstructions.

INTRODUCTION

On May 26, 1994, NJDOH FACE personnel were informed of this work-related fatality by the county medical examiner's investigator. A site visit was conducted on June 13, 1994. Information for this report was derived from the OSHA file, medical examiner's report, police report, and interviews of safety management representatives of the employer.

The employer was an electrical utility company that has been in business for more than 100 years and employed almost 2000 people at the time of the incident. The deceased, a 30 year-old apprentice lineman, was employed for five years by the company, originally as a helper. He had completed half of his three year lineman apprenticeship program.

The company had an extensive training program for apprentices and linemen. The lineman

apprenticeship consisted of three years of classroom work and on the job training and experience. During the first week, potential apprentices are evaluated for climbing ability. If successful, two weeks are then spent in a combination of basic classroom and field training. Beginning in the fourth week, they become field helpers. At the third month, apprentices return to the classroom for more advanced theory. The remainder of the three years is a combination of classroom and field work.

Written safety rules and regulations are contained in the company's safety manual, including procedures for setting poles.

The workforce was unionized. A joint management and labor committee has been in existence for several years but was reorganized more than a year before this incident to include more labor participation.

INVESTIGATION

The incident site was an area just outside a company substation that was enclosed with a chain link fence. Three-phase transmission lines bring 69,000 volts of electricity to the substation. From there it is stepped down and distributed to users. In order to close two other substations, the company was in the process of upgrading their facilities in this substation. New poles were needed to carry additional distribution lines.

In the afternoon of the incident, skies were overcast. There had been showers earlier in the day but the weather was dry while the crew was working. A three-man crew was assigned to set poles. The crew consisted of a work leader, lineman, and apprentice lineman (victim) who had been working together for two months doing varied types of work. Their work day started at 8 a.m.. The three received their assignment, assembled their vehicles, and picked up the utility poles they would need for their assigned jobs.

The wooden utility poles are stored outdoors on the company's premises, stacked on supports so they are off the ground and grouped according to lengths. Using a derrick truck, workers manually slip a steel chain choker around the middle of the pole. They balance the pole and often mark the correct balance point. This mark is used again when the pole is being readied to be set into the ground. Using the choker, suspended from a winch line, the poles are loaded onto a pole trailer (a flat bed truck).

The crew first went to a private home and set a new pole there. They arrived at the substation and set one pole inside the substation yard. After lunch, they resumed their assignment to set two 45-foot poles outside the fence on the opposite side of the facility. This area was directly under a three phase, 69,000 volt transmission line.

A privately-owned pickup truck was parked in the area in which the crew wanted to park and position their equipment. Unable to locate the owner of the vehicle, they had to position their equipment around the truck. Mindful of the overhead lines, the work leader and apprentice talked about overhead clearances before they started work. The work leader saw that the transmission lines were supported by 75 foot utility poles and felt that they had sufficient clearance to set the new 45 foot poles. This area had previously been evaluated by a company representative who gave approval for the pole setting.

The lineman worked on the derrick truck, operating the controls from the exterior control area seat, while the work leader and apprentice were on the ground.

The control operator was not able to have a clear view of the hole being dug because his vision was obstructed by the pickup truck. The crew first set anchors for the pole, dug the hole (wet because of the location near water) with an auger attached to the boom of the derrick truck, and cleared away the debris with an air compressor. They were then ready to set the poles.

The usual procedure is to unload the pole from the trailer using the choker suspended from the winch line (attached to the boom by an insulated cable). The pole is moved up a few feet while supported by the choker, to make it "butt heavy" for maneuverability. The pole is placed on the ground, elevated on one end on a small support, while the hole is dug. The crew wants to stand the pole in a perpendicular position, about a foot off the ground. As they lift the pole to an upright position with the choker, the shaft of the pole is supported by a mechanical guide, called a grabber. The pole is then set into the hole, guided by the grabber. If the pole is not secured by the grabber on the first attempt, a worker manually pushes it back to the grabber. Dirt is replaced around the base of the pole, which now is upright.

On the day of the incident, as the crew closed the grabber, the pole was not in its grasp. They tried a second time. The apprentice, wearing leather work gloves, guided the pine pressure-treated pole with his hands. As he guided the pole to the grabber, the pole was apparently suspended too far above the ground and its top contacted the lowest phase of the three phase, 69,000 volt energized transmission lines above. The electrical current traveled from the high voltage line to the utility pole and then to the victim. The worker fell to the ground, breaking contact with the pole and energy source. The victim's co-workers, who are certified in cardio-pulmonary resuscitation (CPR) yearly, immediately initiated CPR and were able to sustain his heart beat. He was transported by rescue squad to the nearest hospital emergency room where he was pronounced dead.

At the time of the contact of the wooden pole with the high energy line, one worker reported hearing a "fuzzing" sound. The line was undamaged and continued in uninterrupted service. One small contact mark was found on the top of the utility pole. The utility company conducted a reenactment of the incident two days later; the overhead line was deenergized at the time of the reenactment.

CAUSE OF DEATH

The medical examiner determined that death was caused by electrocution. The victim had electrothermal burns on both hands and on his chest. No entrance or exit sites were specified by the medical examiner.

RECOMMENDATIONS/DISCUSSIONS

The first two recommendations have been derived from the utility company's internal investigation and their decisions about methods to prevent this type of incident from reoccurring during pole setting under transmission lines:

RECOMMENDATION # 1: When setting utility poles under transmission lines, deenergize the line, test and ground it.

DISCUSSION: Transmission lines carry electrical current with very high voltages. The line in this incident carried 69,000 volts, but there are transmission lines that carry even higher voltages. The utility company has stated that deenergizing the line must be the first priority in order to prevent electrical injuries.

RECOMMENDATION # 2: If transmission lines cannot be deenergized, minimum distances between power lines and equipment or workers must be maintained.

In this situation, the distance between the ground and the lowest point of the bottom phase of the transmission line was 46 feet, 10 inches. This allowed only 1 foot, 10 inches of clearance between the pole and the line if the pole was upright on the ground.

Although the company owns distribution lines and their supporting poles that are located under very high voltage transmission lines, the transmission lines cannot always be deenergized if they are owned by another company. The company's own transmission lines can usually be taken out of service, depending upon what is serviced by those lines and the consequences of not supplying that power.

The company evaluated OSHA's standards (29 CFR 1926.950 and 29 CFR 1910.269), the New Jersey High Voltage Proximity Act, and the National Electrical Code and decided upon minimum clearance distances between equipment and the lowest phase of transmission lines. In this situation, with 69,000 volts, the minimum clearance would be 11 feet. The distance from the pole will be measured using a company-approved method which includes electronic measuring devices. If proper clearances cannot be maintained and the transmission line cannot be deenergized, the company will utilize a method during which specially-trained workers use "hot line tools." This method requires high level company approval and planning.

RECOMMENDATION # 3: When setting poles near existing power lines, any worker who may contact the utility pole or power line should be protected with appropriate personal protective equipment.

DISCUSSION: Since physical contact with the pole may be made by a ground worker, he or she should be protected with rubber gloves and sleeves appropriate to the potential contact voltage.

The company is evaluating purchasing equipment for use in situations in which clearance cannot be maintained and the high voltage lines cannot be taken out of service. Possible equipment purchases may include rubber insulating pole caps that can be placed on the end of the pole (rated for high voltages). Workers should wear insulated personal protective equipment while guiding the pole even if pole caps are used.

RECOMMENDATION # 4: Company representatives who evaluate work sites should consider both the work needed and safety hazards in the area.

DISCUSSION: If hazards are present, plans should be made for worker protection before the job is assigned. This will alert workers to dangers and be the first step in determining ways in which a job can be completed without endangering the worker.

RECOMMENDATION # 5: The work area should be clear of vehicles or other obstructions.

DISCUSSION: The control operator was unable to have a clear and unobstructed sight of the work being done. If vehicles are illegally parked in the area, the work should not proceed until obstructions or vehicles are removed by the owners or the police.