The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research

Painter Electrocuted When Metal Ladder Contacts a Powerline–Virginia

FACE 92-27

SUMMARY

A 21-year-old painter (the victim) was electrocuted when the metal ladder he was moving contacted an overhead powerline. Prior to the incident, the victim and two co-workers had been painting the exterior of a two-story private residence. Work had concluded at 9 p.m., and the workers were cleaning up the jobsite. The victim, for unknown reasons, walked around the side of the residence and began moving the ladder. The ladder had been positioned against the side of the residence and had been used to reach the upper level of the residence, when the workers were scraping and painting the structure. As the victim moved the ladder to a vertical position, it came into contact with an overhead powerline located about 24 feet above ground level and directly above the victim's position. Electrical current passed through the ladder and victim to ground, electrocuting the victim. NIOSH investigators concluded that to prevent future similar occurrences, employers should:

- **eliminate the use of conductive ladders in proximity to energized electrical conductors**
- **make arrangements with local utility companies to de-energize or cover powerlines with insulating line hoses or blankets when work is to be performed in proximity to overhead powerlines**
- **develop and implement safety programs that are designed to enable workers to recognize, report, and avoid hazards, especially electrical hazards (e.g., overhead powerlines)**
- **conduct a jobsite survey to identify potential hazards and develop and implement appropriate control measures for these hazards**
- **have equipment (e.g., ladders) inspected on a regular basis by a competent person and remove any defective or damaged equipment from service**

Additionally, ladder manufacturers should:

- **consider the use of non-conductive materials in the manufacture of ladders.**

INTRODUCTION

On July 9, 1992, a 21-year-old male painter (the victim) was electrocuted when the metal ladder he was moving contacted an overhead powerline. On August 21, 1992, officials of the Virginia Occupational Safety and Health Administration (VAOSHA) notified the Division of Safety Research (DSR) of this fatality, and requested technical assistance. On August 28,

1992, a safety specialist from DSR conducted an investigation of this incident. The investigator reviewed the incident with the VAOSHA compliance officer assigned to the case and visited and photographed the incident site. A copy of the medical examiner's report was obtained during the site visit.

The employer in this incident was a small general contracting company that had been in business for 13 years. The company employed four workers, including three painters. The company had no formal written safety or training programs; however, safety warnings were given intermittently by the owner. The victim had worked for this employer for 2 days as a painter prior to the incident. This was the first fatality the company had experienced.

INVESTIGATION

The company had been contracted to repaint a two-story wooden private residence. Work had been in progress for 3 days prior to the incident, and this was the victim's second day of employment.

On the day of the incident, three workers (including the victim) and the company owner arrived at the residence to continue scraping and painting the residence. A 40-foot-long aluminum extension ladder, which was missing the rope used to raise and lower the upper ladder section, had been extended to 26 feet 2 inches and positioned on the east side of the residence in order to scrape and paint the second story of the residence. Additionally, a three-phase overhead powerline system (19,500 volts phase to ground), was located about 10 feet away from, and parallel to, the east side of the residence. The powerline was approximately 24 feet above ground level. At the time of the incident, work had been in progress about 12 hours, and at 9 p.m. the workers had completed the day's work and were in the process of cleaning up the jobsite and work materials. Earlier in the day the victim had been instructed not to move the ladder. However, at this time, for some unknown reason, he walked around the side of the residence and began moving it. The victim stood at the base (feet) of the ladder and pulled it away from the side of the building, standing it upright. The top section of the ladder, about 2 feet down from the top of the ladder, contacted the outside phase of the three-phase overhead powerline system (Figure). Electrical current passed through the ladder, entering the victim's hands and exiting through his feet. After a few seconds, the victim fell to the ground when a reclosure switch, located on a nearby utility pole, opened, stopping the flow of electricity.

When the incident occurred, one of the co-workers heard a loud noise and saw sparks at the point where the ladder was in contact with the powerline. He rounded the corner of the residence and saw the victim lying on the ground. Also, a neighbor heard two loud noises and her electricity went off. She ran out of her house and saw the victim lying on the ground with his clothes on fire. The co-worker and neighbor extinguished the fire as the company owner called the emergency medical service (EMS). The EMS arrived in about 10 minutes, and transported the victim to the local hospital emergency room where the victim was pronounced dead on arrival.

CAUSE OF DEATH

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

RECOMMENDATIONS/DISCUSSION:

Recommendation #1: Employers should eliminate the use of conductive ladders in proximity to energized electrical conductors.

Discussion: OSHA Standard 29 CFR 1926.450(a)(11) states that "portable metal ladders shall not be used for electrical work or where they may contact electrical conductors." Ladders made of non-conductive materials, e.g., fiberglass, should be substituted for work near energized electrical conductors.

Recommendation #2: Employers should make arrangements with local utility companies to de-energize or cover powerlines with insulating line hoses or blankets when work is to be performed in proximity to overhead powerlines.

Discussion: Energized overhead powerlines in proximity to a work area constitute a safety hazard. Extra caution must be exercised when working near energized powerlines. A safe distance between powerlines and ladders, tools, scaffolds and work materials should be maintained at all times. The powerline in this incident was within 10 feet of the residence. When this type of situation occurs, overhead powerlines should be de-energized or covered with insulating material.

Recommendation #3: Employers should develop and implement safety programs designed to enable workers to recognize, report, and avoid hazards, especially electrical hazards (e.g., overhead powerlines).

Discussion: The danger of overhead powerlines should be obvious; however, contact with overhead powerlines and subsequent occupationally-related fatalities continue to occur. OSHA Standard 29 CFR 1926.21(b)(2) states that "The employer shall instruct each employee in the recognition and avoidance of unsafe conditions and the regulations applicable to his work environment to control or eliminate any hazards or other exposure to illness or injury." Employers should provide employees with adequate training to ensure that they can recognize potential hazardous exposures. Evidence suggests that the worker, even though warned about moving the ladder, did not realize the hazard created by moving a metal object (aluminum ladder), in proximity to overhead powerlines. Safety programs should include detailed safety procedures (specific for all tasks and job categories) needed to prevent worker exposure to hazards. For these procedures to be effective, they must be clearly communicated and fully understood by the affected employees and supervisors. Additionally, a NIOSH Alert entitled "Request for Assistance in Preventing Electrocutions of Workers Using Portable Metal Ladders Near Overhead Power Lines" provides additional recom- mendations pertaining to work being performed in proximity to energized conductors.

Recommendation #4: Employers should conduct a jobsite survey to identify potential hazards and develop and implement appropriate measures for these hazards.

Discussion: Before beginning work at any site, a competent[1] person should evaluate the site to identify any potential hazards and ensure appropriate control measures are implemented. The jobsite had at least one identifiable hazard (i.e., a 19,500-volt overhead powerline in proximity to the east side of the residence where work was being performed). In this incident, control measures included using a non-conductive ladder and/or having the powerline de-energized or covered with insulating hoses or blankets by the utility company.

Recommendation #5: Employers should have tools and equipment (e.g., ladders) inspected on a regular basis by competent personnel and any defective or damaged equipment should be removed from service.

Discussion: The 40-foot aluminum extension ladder, which was being used at the jobsite, was missing the rope used to raise and lower the upper ladder section. If the ladder had been equipped with the rope, and the victim had been trained in the proper procedure of raising and lowering the ladder using the rope, the victim may have lowered the ladder to a safe height before attempting to move it. When tools or equipment are found to be defective, they should be removed from service or properly repaired.

Recommendation #6: Ladder manufacturers should consider incorporating non-conductive materials in the manufacture of aluminum ladders.

Discussion: The use of nonconductive materials in the manufacture of aluminum ladders could provide passive protection to all affected workers in the event of an inadvertent contact with an electrical conductor. One possibility to consider is the placement of a fiberglass link in the side rails of new aluminum ladders. This link would provide isolation so electricity does not have a path to ground. Additionally, incident data from the U.S. Consumer Product Safety Commission suggest that approximately 42% of ladder contact with powerlines occurs within the top 3 feet of the ladder. Therefore, consideration should be given to insulating the ladder's top few feet with a material that is non-conductive (e.g., heavy teflon). As human limitations and behaviors are known to contribute to risk (i.e., the human visual system is limited in its ability to estimate the clearance distances to powerlines, and warning labels are commonly disregarded), the use of passive safety interventions may be warranted.

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[1] Competent person — one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

REFERENCES

Office of the Federal Register: Code of Federal Regulations, Labor 29 Part 1926. pp. 20 and 171. July 1, 1989

Bellegarde, Marie L. Human Factors Analysis of Aluminum Ladders/ Powerlines Electrocution Hazard, U.S. Consumer Product Safety Commission: pp. 5-9, October 1988.

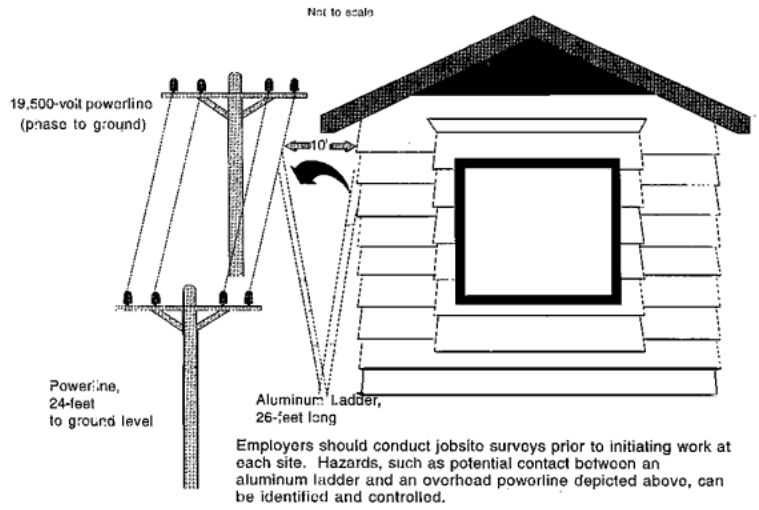

Figure. Aluminum Ladder Contacting Overhead Powerline

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Last Reviewed: November 18, 2015