

## Preventing Worker Deaths and Injuries from Contacting Overhead Power Lines with Metal Ladders

### Summary

Workers risk electrocution when using metal ladders around energized, overhead power lines. The National Institute for Occupational Safety and Health (NIOSH) has developed recommendations to prevent injuries and deaths while working with metal ladders.

### Description of Exposure

A NIOSH review of the Bureau of Labor Statistics (BLS) Census of Fatal Occupational Injuries (CFOI) data from 1992–2005 identified at least 154 electrocution deaths that resulted from contacting overhead power lines with portable metal ladders (excluding truck-mounted and aerial ladders) [NIOSH 2007a]. Of these 154 deaths, 36 involved a person of Hispanic origin (CFOI data for all years exclude New York City; the data for 2005 are preliminary). Although Hispanic workers accounted for 23% of

these electrocution deaths due to ladders contacting power lines, it is estimated that they made up only 11% of the workforce during this period [NIOSH 2007b].

The NIOSH Fatality Assessment and Control Evaluation (FACE) Program is designed to identify, study, and prevent fatal occupational injuries [www.cdc.gov/niosh/face]. A review of NIOSH FACE cases between 1987 and 2007 identified 11 investigations involving the deaths of 12 workers that occurred while working around overhead power lines and using metal ladders. Ladder contacts with power lines usually occurred during erection, lowering, or relocation of the ladder.

The surveillance data indicate a disproportionate rate of deaths among Hispanic workers involved in incidents related to metal ladders making contact with overhead power lines. Recent investigations of Hispanic worker deaths have also highlighted the need for

worksite surveys and hazard controls and identified additional safety measures for workers whose primary language is not English. Two cases are described below.

### FACE Case Study 1

A 32-year-old Hispanic painter was electrocuted when the metal ladder he was carrying contacted an overhead power line. His first language was Spanish, though he reportedly spoke some English.

Before the incident, the victim and his coworkers had been painting a private residence. As the workers were beginning to clean up at the end of the workday, the victim picked up his 40-foot metal ladder and retracted it to approximately 20 feet. While carrying the ladder upright to the work van, the foreman and a coworker verbally warned the victim about the power line, reportedly in English and Spanish. Several seconds later, the victim's ladder contacted

the 13,200-volt overhead power line located approximately 21 feet above the ground. The victim was taken by ambulance to a hospital, where he was pronounced dead in the emergency room [NIOSH 2004a].

## FACE Case Study 2

A 24-year-old Hispanic, Spanish-speaking painter was electrocuted when the metal ladder he was repositioning contacted a 24,000-volt overhead power line 21 feet above the ground. The victim and his coworkers were painting several two-story townhouses. While the worker was repositioning his 28-foot metal extension ladder (which was extended to 26 feet), the ladder contacted the overhead power line located approximately 16 feet from the painting operation (see Figure 1). Several seconds later, the foreman heard a buzzing sound and saw the victim gripping his ladder before falling to the ground. The victim was pronounced dead in the hospital emergency room [NIOSH 2004b].

## Controls

Employers, workers, general contractors, and ladder manufacturers should take the steps outlined in the following sections to protect workers while working around overhead power lines. Many of these steps



**Figure 1.** Overhead power line 16 feet from the painting operation in FACE Case Study 2. Photograph courtesy of the North Carolina Occupational Safety and Health Administration [NIOSH 2004b].

are required or suggested by Occupational Safety and Health Administration (OSHA) regulations.

For workers in the construction industry, 29 CFR\* 1926 includes requirements for worker training [29 CFR 1926.1060 and 1926.21(b)(2)], safe use of ladders [29 CFR 1926.1053], working near an electric circuit [29 CFR 1926.416(a)], and providing prompt medical attention in the event of serious injury [29 CFR 1926.50]. For workers in other industries, 29 CFR 1910.333 specifies minimum distances between workers using conductive equipment and power lines. Both sets of regulations provide good guidance for protecting workers from contact with overhead power lines, regardless of whether the regulations are required by the industry employing the workers.

## Employers—Site Setup

- Identify the location of overhead power lines as a routine part of all initial worksite surveys for jobs involving the use of ladders. Always note power line heights and distances from work areas on site diagrams to provide key information for site supervisors and workers.
- Avoid or limit proximity to power lines whenever possible. Consider ladder length and room for ladder staging (safely raising and lowering ladders).
- Notify the local electric utility company for assistance if work needs to be done near energized, overhead power lines.
- Ensure that workers maintain a safe working distance between power lines and equipment or structures that require periodic maintenance or access.
- Do not store materials or equipment below or near overhead power lines.
- Eliminate the use of metal ladders near energized overhead power lines.
- Ensure that workers keep conductive objects at least 10 feet away from unguarded, energized lines up to 50 kilovolts. For every 10 kilovolts above 50 kilovolts, maintain an additional 4 inches of clearance.

\*Code of Federal Regulations. See CFR in References.

## Employers—Worksite

- As part of the site safety program and orientation, make supervisors and workers aware of power line distances from work areas, including ladder length and ladder staging areas. Use site diagrams to communicate this information and ground level signs or taped markers to remind workers of overhead power line locations.
- For training, consider the languages and reading levels of the workers. Explain the risks and consequences of contacting overhead power lines. Explain and provide hands-on practice in recognizing hazards and avoiding unsafe conditions with ladders and overhead power lines.
- Do not use metal ladders near energized overhead power lines. Provide the appropriate American National Standards Institute (ANSI) approved ladders for work near energized, overhead power lines.
- Prevent movement into a power line by ensuring that ladders are stable, level, and adequately supported (i.e., tied or blocked).
- Ensure that workers are provided with a means of emergency communication and are also trained in approaching injured workers and providing aid during an electrical incident, including first aid and cardiopulmonary resuscitation (CPR).

## Workers

- LOOK UP! Note the location of overhead power lines at the start of each job.
- Always assume all overhead lines are energized and dangerous.
- Do not use metal ladders when working around or near overhead power lines.
- Always lower the ladder and carry it horizontally when moving it to avoid contacting overhead power lines. Have someone help carry and set up long and unwieldy ladders.
- Follow the 1:4 rule—For every 4 feet between the ground and the upper point where a ladder is resting, set the feet of the ladder out 1 foot horizontally. For example, if the ladder is resting

on the edge of a roof 16 feet above the ground, the bottom of the ladder should be 4 feet out from that edge.

- Never touch or go near a person or equipment (such as a ladder) that is in contact with an overhead power line.
- Follow all safety rules; if you have any questions or concerns, ask your employer or supervisor.

## General Contractors

- Ensure through contract language that all subcontractors implement safety and health programs and training specific to the worksite and the hazards present while working around overhead power lines.

## Ladder Manufacturers

- Consider affixing bilingual labels with graphics to provide hazard warnings and instructions for the safe use of ladders to workers whose primary language is not English.

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## For More Information

The information in this document is based on data, FACE reports, and expert review. More information about the NIOSH FACE program is available at [www.cdc.gov/niosh/face](http://www.cdc.gov/niosh/face).

The NIOSH safety and health topic page on electrical safety is available at [www.cdc.gov/niosh/topics/electrical/](http://www.cdc.gov/niosh/topics/electrical/). This page includes further guidance on preventing electrocutions of workers using metal ladders and guidance on electrocution hazards associated with scaffolds, tree trimming, and cranes, among others.

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