

Preventing Electrocutions During Work with Scaffolds Near Overhead Power Lines

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WARNING! Workers may be electrocuted when erecting, moving, or working from metal or conductive scaffolds near overhead power lines.

The National Institute for Occupational Safety and Health (NIOSH) requests assistance in preventing electrocutions of workers who contact overhead power lines when erecting or moving scaffolds, or when using conductive tools or materials from scaffolds. Recent NIOSH investigations conducted under the Fatal Accident Circumstances and Epidemiology (FACE) Program suggest that many employers, contractors, and workers may be unaware of the hazards of working with scaffolds near uninsulated overhead power lines.

This Alert describes 13 deaths that occurred in six separate incidents when workers erected or moved scaffolds that came into contact with energized, overhead power lines, or when they contacted overhead power lines while using conductive tools or materials from scaffolds. To prevent such electrocutions, the recommendations in this Alert should be followed by

every employer, manager, supervisor, and worker where scaffolds and conductive tools or materials are used near overhead power lines. Editors of appropriate trade journals, safety and health officials, and other persons (especially those in the building trades) are requested to bring this Alert to the attention of employers, contractors, and workers.

BACKGROUND

When scaffolds, conductive tools, or other materials contact overhead power lines (see Figure 1), workers receive serious and often fatal injuries. Data from the NIOSH National Traumatic Occupational Fatalities (NTOF) data base indicate that nearly 6,500 traumatic work-related deaths occur each year in the United States; an estimated 7% of these fatalities are electrocutions [NIOSH 1991]. The NTOF data base also shows that from 1980 through 1986, at least 25 deaths resulted when workers contacted overhead power lines while erecting or moving scaffolds or while using conductive tool on scaffolds.

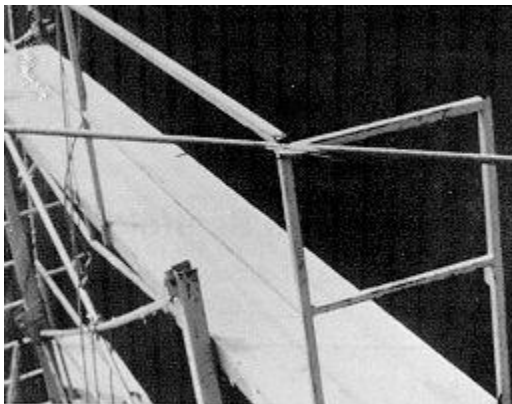


Figure 1. *Metal scaffold contacting an overhead power line.*

A review of the NTOF data has revealed that many occupational groups (e.g., brickmasons, carpenters, painters, construction laborers, and plasterers) are at risk of electrocution because their jobs involve working from scaffolds near overhead power lines [NIOSH 1991]. Through the FACE program, NIOSH investigated 13 scaffold-related electrocutions occurring over a 39-month period (June 1986 through September 1989). Because the FACE program is

active in only 11 states, these fatalities represent only a small proportion of the scaffold-related electrocutions that occur each year in the United States.

Current OSHA Regulations

Current Occupational Safety and Health Administration (OSHA) regulations for the construction industry require employers to do the following:

- Instruct each worker to recognize and avoid unsafe conditions [29 CFR* 1926.21(b)(2)]
- Provide prompt medical attention in case of serious injury [29 CFR 1926.50]
- Advise workers exposed to electrical hazards and protect against electric shock by de-energizing the circuit or by guarding it effectively with insulation or other means [29 CFR 1926.416(a)(1) and (a)(3)]
- Lock panels (scaffold sections or tiers) together vertically with pins or other equivalent means where uplift (separation of panels) may occur [29 CFR 1926.451(d)(6)]

OSHA has proposed revisions to the current safety regulations to prevent workers from placing scaffolds where they might contact overhead power lines or other energized circuits [51 Fed. Reg. 42706 (1986)]. These proposed regulations require that the following minimum clearances be maintained between scaffolds and exposed, energized power lines:

- 2 feet for insulated power lines of less than 300 volts
- 10 feet for insulated power lines of 300 volts or more and for all uninsulated power lines

Case Reports

As part of the FACE Program, NIOSH investigated 13 electrocutions in six incidents that occurred between June 1986 and September 1989. Each incident involved electrical contact with conductive tools or materials used by workers on scaffolds, or workers who erected or moved scaffolds near overhead power lines.

Case No. 1—Two Fatalities

On June 17, 1986, a 28-year-old painter and a 33-year-old carpenter were painting church windows from a tubular, welded-frame scaffold approximately 25 feet high and mounted on rubber casters. After the workers had completed one side of the church, they attempted to move the scaffold to another location to continue painting. The workers passed the scaffold under a 12,000-volt power line that was approximately 30 feet above ground level. They then changed direction and tried to pass the scaffold under the same power line at a point that was only 24 feet above ground level. The scaffold contacted one phase of the power line, providing a path to the ground for the electric current. The two workers grasping the scaffold were electrocuted [NIOSH 1986e].

Case No. 2—One Fatality

On August 27, 1986, a company owner and six workers were painting a concrete silo. A 5- by 7-foot tubular, welded-frame scaffold was erected to reach the top of the silo approximately 6 feet across from a 7,200-volt power line. Workers were using 8-foot aluminum poles with rollers to paint the side of the silo. A 19-year-old laborer who was painting from the scaffold pulled the aluminum pole back onto the scaffold to load more paint onto the roller. In doing so, he contacted the power line with the aluminum pole and was electrocuted [NIOSH 1986g].

Case No. 3—Four Fatalities

On October 31, 1986, a crew of four painters (aged 56, 37, 37, and 31) completed painting one side of a three-story structure. The crew was using a five-tier, tubular, welded-frame scaffold mounted on 5-inch, rubber-clad aluminum wheels. The painters and the crew chief attempted to move the 28.5-foot scaffold to the other side of the structure. The scaffold contacted one phase of a 12,000-volt power line that was approximately 27.5 feet above the ground. The contact created a path to the ground for the electric current. The four painters were electrocuted and the crew chief was severely burned [NIOSH 1986a].

Case No. 4–One Fatality

On November 24, 1986, seven employees of a masonry company were erecting a brick wall from a tubular, welded-frame scaffold approximately 24 feet high. The scaffold had been constructed approximately 21 inches across from a 7,620-volt power line. A laborer carried a piece of wire reinforcement (10 feet long by 8 inches wide) along the top section of the scaffold and contacted the power line with it. The laborer, who was wearing leather gloves, received an electric shock and dropped the wire reinforcement, which fell across the power line and simultaneously contacted the metal rail of the scaffold, energizing the entire scaffold. A 20-year-old bricklayer standing on the work platform in contact with the main scaffold was electrocuted [NIOSH 1986f].

Case No. 5–Two Fatalities

On June 5, 1987, a seven-tier, tubular, welded-frame scaffold (31 feet high) was erected to paint a 33-foot-high sign at the entrance of a new shopping mall. After the sign had been partially painted, the scaffold was moved to allow concrete to be placed in the area around the sign. The scaffold was positioned approximately 10 feet horizontally from a 13,750-volt overhead power line. Several days later, the crew of seven workers (carpenters, laborers, and painters) were instructed to replace the scaffold and finish painting the sign. The crew positioned themselves around the scaffold and attempted to lift it approximately 5 inches onto the newly constructed concrete pad. As they were lifting the scaffold, the top section partially separated from the adjoining section, toppled over, and contacted the power line. A 28-year-old carpenter and a 31-year-old laborer were electrocuted. The other five workers were hospitalized with electrical burns [NIOSH 1987b].

Case No. 6–Three Fatalities

On September 25, 1989, six workers were using a mobile, elevated work platform to install aluminum siding on a warehouse under construction. The platform measured 25.5 feet from ground level to the top guardrail.

Approximately 3 days before the incident, the crew had passed the platform under a 69,000-volt overhead power line located 34 feet above the ground. On the day of the incident, the crew tried to pass the platform under the same power line at a different location where the power line was only 27 feet above ground level. In addition, fill dirt brought into this location for landscaping caused the ground level to slope upward approximately 1.5 feet. As the crew passed the platform under the power line, the top guardrail contacted the bottom phase of the power line. Three crew members (a 30-year-old laborer and two steel workers aged 34 and 38) were electrocuted; three others were seriously burned [NIOSH 1990b].

Conclusions

Many employers, contractors, and workers may be unaware of the hazards of working with scaffolds near overhead power lines. If the current and the proposed OSHA regulations had been followed, particularly with regard to minimum clearances, the electrocutions reported here could have been prevented.

Recommendations

The following precautions should be taken to prevent electrocutions and injuries resulting from contact between overhead power lines and conductive tools, materials, or scaffolds:

- Employers, contractors, and workers should comply with the current OSHA regulations for working with scaffolds near energized power lines [29 CFR 1926.21(b)(2), 1926.50, 1926.416(a)(1), 1926.416(a)(3), 1926.451(d)(6)].
- In accordance with the proposed OSHA regulations [51 Fed. Reg 42706 (1986)], scaffolds should not be used or moved within the following minimum clearance distances from exposed, energized power lines:
 - 2 feet for insulated power lines of less than 300 volts
 - 10 feet for insulated power lines of 300 volts or more and for all uninsulated power lines

- Employers should review existing safety programs and revise them where needed to address work with scaffolds around power lines.
- Employers should develop and implement safety programs where none exist. Comprehensive safety programs should include, but not be limited to, safety training in the hazards of scaffolds and power lines, with special emphasis on avoiding inadvertent contact.
- Managers and workers should conduct initial and daily surveys at the worksite before beginning any job; managers should then implement appropriate control measures and training to address hazards identified at the site.
- Employers should inform workers about the hazards of erecting, moving, or working from scaffolds near overhead power lines or other energized circuits. These instructions should emphasize that most overhead, high-voltage power lines are not insulated and that workers should assume that such lines are not insulated if there is any doubt.
- Employers should notify the utility company when scaffolds must be erected or moved in areas with overhead power lines where the required clearances cannot be maintained. In such situations, utility companies should de-energize the power lines or cover them with insulating hoses or blankets before any work is initiated.
- Before a scaffold is erected or moved, employers should ensure that workers consider the following factors:
 - Distance from overhead power lines
 - Vertical clearance between the ground and any sagging power lines
 - Scaffold height and weight
 - Wheel condition
 - Obstacles
 - Ground slope or changes in elevation that may alter clearance distance
 - Other ground or floor conditions
- Clearance between the power lines and scaffold should be monitored. If a scaffold is to be moved in the vicinity of overhead power lines, a competent worker should be assigned to observe the clearance and warn others if the minimum distance is not maintained.

- Electrically conductive tools or materials should not be used where they may contact overhead power lines. Nonconductive tools or materials should be substituted.
- Manufacturers should consider developing scaffolds made of nonconductive materials.
- Employers should establish procedures to be followed in emergencies (for example, if a scaffold contacts an electric power line, keep all unauthorized personnel away from the area).
- All employers and workers should be trained in cardiopulmonary resuscitation (CPR) [NIOSH 1986c, 1989a, 1989b, 1990a].
- Manufacturers or purchasers of scaffolds should affix conspicuous decals to each scaffold section warning about the hazards of contacting overhead power lines.

NIOSH urges safety and trade associations, electric utility companies, product manufacturers, and OSHA State consultative services to bring these recommendations to the attention of all employers and workers using scaffolds.

Acknowledgments

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Further information about electrical hazards is available in seven previously published NIOSH Alerts [NIOSH 1984, 1985, 1986b, 1986c, 1987a, 1989a].

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Note

* Code of Federal Regulations. See CFR in references. [\[Return to main text\]](#)

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