



The National Institute for Occupational Safety and Health (NIOSH)

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through safety and health research



HVAC Contractor and Employee Electrocuted in Crawlspace—North Carolina

FACE 94-17

SUMMARY

A 46-year-old male HVAC contractor and his 23-year-old employee (the victims) were electrocuted while installing air conditioning duct work in a crawlspace. The contractor and employee were installing a combination heating, ventilating, and air conditioning unit at a private residence. The employee was under a 38-inch-high crawlspace installing aluminum straps around the new duct work, using an electric drill to install screws through the straps. As the employee drilled a hole, the sharp edge of the strap contacted house wiring attached to a floor joist above him, damaging its insulation. This action allowed the drill bit and strap, which the employee was holding, to become energized. The current passed through the employee to ground, either through a cast iron sewer drain pipe or through cold water pipes in the immediate working area of the victim. The contractor, installing duct work in the attic, was summoned to the crawlspace by the residence owner, who had heard noise in the crawlspace. The contractor called into the crawl space for the employee, but did not receive an answer. The contractor entered the crawlspace and grabbed the victim while leaning against the same water pipe as the victim, allowing the current to flow through him to the ground. The owner of the residence pulled the main circuit breaker for the house and called 911. Police, fire, and emergency medical service personnel responded to the scene and, finding both men in cardiac arrest, initiated cardiopulmonary resuscitation. The victims were transported to the local hospital, where they were pronounced dead by the attending physician. NIOSH investigators determined that, in order to prevent similar incidents, employers should:

- **conduct a jobsite survey before starting any work to identify any hazards, implement appropriate control measures, and provide subsequent training to employees specific to all identified hazards**
- **develop, implement and enforce a comprehensive written safety program**
- **provide additional electrical safety training to those workers working with or around electrical current, including proper rescue procedures.**

INTRODUCTION

On August 30, 1994, a 46-year-old male HVAC contractor and his 23-year-old employee (the victims) were electrocuted while installing air conditioning duct work in a crawlspace. On August 31, 1994, officials of the North Carolina Occupational Safety and Health Administration notified the Division of Safety Research (DSR) of this fatality, and requested technical assistance. On September 22, 1994 a DSR safety specialist conducted an investigation of the incident. The incident was reviewed with the NCOSHA compliance officer, the city police, and the county electrical and mechanical inspectors.

The employer in this incident was a heating, ventilation, and air conditioning (HVAC) contractor that had been certified by the county as an HVAC technician since 1965. The contractor employed one other worker on an as-needed basis the past few years. The contractor had no written safety policy or safety program. Training was completed on the job. These were the first fatalities experienced by the contractor.

INVESTIGATION

The employer had been contracted to install a new combination heating, ventilation, and air conditioning unit at a private residence, and had hired a part-time employee that had worked for him in the past. The job consisted of installing ductwork throughout the residence and setting the unit in place in a 38-inch-high crawlspace under one end of the house.

On the day of the incident, the contractor was in the attic of the residence installing ductwork, while the employee was installing aluminum straps around the ductwork in the crawlspace. An iron sewer drain pipe was located in the sandy-soil floor of the crawlspace in the employee's immediate work area. Wiring from some of the house's electrical circuits was also attached to the floor joists.

The employee was using an electric drill, powered by an extension cord that was plugged into a 110-volt outlet, to power drive the screws through the aluminum straps into the floor joists. As the employee began to drill one of the screws through the aluminum strap, the sharp edge of the strap contacted the house wiring, damaging its insulation. The edge of the strap contacted an energized conductor, and the electrical current flowed through the strap and drill bit, then through the victims' hand and body, going to ground through the iron sewer drain pipe. The victim did not fall away from the energized strap and the electrical circuit remained complete.

The home owner heard noise from in the crawlspace and summoned the contractor from the attic. Upon arriving at the crawlspace and receiving no response from the employee, the contractor entered the crawlspace. In an attempt to pull the employee from under the crawlspace, the contractor grabbed the victim and became part of the electrical circuit and path to ground.

The homeowner immediately entered the house and pulled the main circuit breaker, then called 911. Police, fire, and emergency medical service (EMS) personnel were dispatched to the scene. The EMS personnel found both victims in cardiac arrest. They were removed from the crawlspace and CPR was initiated. The two victims were transported to the local hospital where they were pronounced dead by the attending physician.

CAUSE OF DEATH

The attending physician listed the cause of death for both victims as accidental electrocution.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should conduct a jobsite survey before starting any work to identify any hazards, implement appropriate control measures, and provide subsequent training to employees specific to all identified hazards.

Discussion: Prior to any work being undertaken, a jobsite evaluation should be performed by a competent person¹ to identify potential hazards – such as the house wiring in proximity to the area where drilling was being performed. Once potential hazards are identified, appropriate control measures can be implemented and corresponding employee training provided. For example, the employee could have been instructed to anchor the ductwork in areas where no house wiring was present and to keep the sharp strap edges away from the house wiring.

Recommendation #2: Employers should develop, implement and enforce a comprehensive written safety program.

Discussion: The employer did not have a written safety program. The development, implementation, and enforcement of a comprehensive safety program should reduce and/or eliminate worker exposures to hazardous situations. The safety program should include, but not be limited to, electrical safety training, hand tool safety, and training in the identification and control of work-related hazards.

Recommendation #3: Employers should provide additional electrical safety training to those workers working with or around electrical current, including proper rescue procedures.

Discussion: Employees whose duties include working on or near electrical circuits should receive training in electrical theory, identification and control of the hazards associated with electrical energy, and proper rescue procedures in the event of worker contact with electrical energy. In this incident, the contractor unintentionally became part of the electrical circuit and path to ground by grabbing the victim without first either de-energizing the circuit or using a non-conductive object to push the employee away from the energy source.

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.

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