The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces through safety and health research NIOSH

# Asbestos Worker Electrocuted

FACE 88-28

## Introduction:

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR), performs Fatal Accident Circumstances and Epidemiology (FACE) investigations when a participating state reports an occupational fatality and requests technical assistance. The goal of these evaluations is to prevent fatal work injuries in the future by studying: the working environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact.

On July 6, 1988, a 23-year-old male laborer on an asbestos removal crew died when he contacted an exposed overhead conductor in a utility tunnel.

## Contacts/Activities:

Officials of a state Industrial Commission notified DSR of this fatality and requested technical assistance. On July 11, 1988 a safety specialist from DSR and representatives of the Industrial Commission visited and photographed the site, and met with representatives of the property owner and police, fire, and ambulance squad personnel.

## Overview of Employer's Safety Program:

The employer in this case was an asbestos abatement contractor with 30 employees. The company has been in business for 3 years. Company safety training focuses on asbestos removal procedures; however, other hazards likely to be encountered in the course of this work are not addressed.

## Synopsis of Events:

The victim and a co-worker comprised one of two 2-man teams removing asbestos from steam lines in a utility tunnel which serves a large educational facility with numerous buildings. The tunnel is approximately 55 inches high by 52 inches wide and runs in a north/south direction. The steam lines run along the east wall of the tunnel. The west wall of the tunnel is covered with numerous heavy electrical cables and signal wire sets. A walkway approximately 36 inches wide extends down the center of the tunnel. Four separate, insulated wires suspended from individual insulators run along the top of the tunnel directly above the walkway. This wiring serves as the power supply for numerous 110-volt light bulb sockets

hanging down on flexible conductors (“pigtails”) at intervals along the tunnel. At the time of the incident, one of the “pigtails” did not have a light socket attached. Therefore, bare, energized conductors were hanging down over the walkway from the wiring circuit.

The victim was removing insulation containing asbestos from the stem lines within the tunnel, while his co-worker was following behind him bagging the insulation. During removal activities, the victim’s shoulder contacted the exposed conductors hanging from the roof of the tunnel. A path to ground was established from the victim’s shoulder through his right arm which was in contact with the steel steam line. The co-worker, who heard the victim yell and saw that he was in contact with the overhead wires, used his body to knock the victim away from the wires. The victim collapsed to the floor of the tunnel.

The co-worker then called the other crew to help remove the victim from the tunnel. The closest way out of the tunnel was the entry to a basement about 57 feet from the incident site. The workers dragged the victim to this entry, took down the plastic containment wall isolating the tunnel from the basement, and removed the victim from the tunnel. A university police officer who was in the basement heard the men and reported the incident via radio to his dispatcher, who called the local fire department and emergency medical service (EMS) unit. The EMS unit and the fire department were on the scene 6 minutes later. Cardiopulmonary resuscitation (CPR) was initiated at the scene and continued while the victim was transported to the local hospital. The victim was pronounced dead at the hospital 57 minutes after the police officer initially reported the incident.

(NOTE: Co-workers and rescue personnel stated that the victim was wet with perspiration at the time of the incident. The high ambient temperature in the tunnel and the protective clothing required for asbestos removal work combined to create a hot working environment for the removal crew.]

## Cause of Death:

The coroner’s office reported the cause of death as electrocution.

## Recommendations/Discussion

**Recommendation #1: Job site surveys should be conducted prior to the start of all construction/demolition projects to ensure that hazards within the area are identified, employees are informed of the hazards, and methods of eliminating or controlling the hazards are implemented.**

**Discussion:** The suspended wires for the lighting circuit should have been identified as potentially hazardous. The bare conductors on the “pigtail” involved in this incident would have been detected if a survey of the actual job site had been performed prior to the start of this project. Once the hazard was identified, corrective action could have been taken to prevent this fatality from occurring.

**Recommendation #2: In an area where asbestos removal work is being performed, electrical equipment should be de-energized whenever possible. If the equipment cannot de-energized, workers should be isolated from potential contact with the energized lines or equipment.**

**Discussion:** Workers performing asbestos abatement work typically wear personal protective clothing which serves to trap body moisture within the suit. In addition, it is standard practice in asbestos removal work to use “wet” removal techniques in which a surfactant-treated water mixture is used to saturate the asbestos-containing materials to control the release of asbestos fibers. The combination of a wet environment and energized electrical circuits or equipment sets the stage for potential disaster.

In this case, the victim was wet with perspiration when the contact with electrical energy occurred. The resistance of the human body to electrical energy (as high as 100,000 ohms when the skin is dry) may be reduced to 1,000 ohms when the skin is wet. This reduced resistance results in the potential for a much greater current flow through the body than would otherwise occur, significantly increasing the potential for a fatal electrical shock.

Shutting down the major electric lines which run through this tunnel was not feasible since they control power to half of the campus; however, these armored cables posed a relatively small threat to the workers. Plastic sheeting along the side of the tunnel could have been erected to isolate these lines from the workers. The lines which actually caused the fatality served only to provide lighting for the tunnel. These lines could have been de-energized prior to the start of the project and a substitute lighting system utilizing ground fault circuit interrupters (GFCI's), battery powered lights, or similar safe system, could have been installed to ensure worker protection.

(NOTE: Further information on electrical hazards encountered during asbestos abatement work is included in Appendix D, "General Safety Considerations," of A Guide to Respirator Selection for the Asbestos Abatement Industry, a joint publication of NIOSH and the Environmental Protection Agency (Doc. # EPA-560-OPTS-86-001).]

**Recommendation #3: Property owners should periodically inspect all areas of their facilities and grounds for the purpose of identifying safety hazards. Unsafe conditions identified during such inspections should be corrected and potential hazards should be controlled in a timely manner to prevent injuries.**

**Discussion:** The lighting circuit in the utility tunnel was an outmoded type of single insulated wire suspended upon individual insulators. The light sockets that hung down from these wires were otherwise unsupported. As a result, the insulation on the wires, as well as the unguarded light bulbs, were subject to damage.

The bare conductors which caused the fatality posed a threat to anyone using the tunnel. A comprehensive safety inspection program conducted by the property owner would have revealed these hazards. Corrective action could have been taken to protect both the employees of the property owner and contract personnel working in or moving through the area.

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Last Reviewed: November 18, 2015