



The National Institute for Occupational Safety and Health (NIOSH)

Promoting productive workplaces
through safety and health research



Laborer Electrocuted in Indiana

FACE 87-62

Introduction:

The National Institute for Occupational Safety and Health (NIOSH), Division of Safety Research (DSR) is currently conducting the Fatal Accident Circumstances and Epidemiology (FACE) Project, which is focusing primarily upon selected electrical-related and confined space-related fatalities. The purpose of the FACE program is to identify and rank factors that influence the risk of fatal injuries for selected employees.

On August 4, 1987, a laborer was electrocuted when he contacted an energized cap on a well casing while searching for a water leak.

Contacts/Activities:

Officials of the Occupational Safety and Health Program for the State of Indiana notified DSR concerning this fatality and requested technical assistance. This case has been included in the FACE Project. During the week of September 21, 1987, a DSR research team visited and photographed the site and interviewed company personnel, co-workers, the victim's supervisor, and the victim's next of kin.

Overview of Employer's Safety Program:

The employer is a gas pipeline contractor that has been in business under the present management for fifteen years. The company presently employs 77 people and currently has no formal safety program. A consultant was contracted to develop a comprehensive safety manual, but all training is conducted "on-the-job."

Synopsis of Events:

The victim was employed as a general handyman at the company garage. The company had moved into new facilities the day prior to the incident. The well supplying water for the new facility was 120 feet deep and was located approximately 100 feet from the office/garage complex. The well was encased in four inch pipe with a submersible pump inside the casing to pump water to the complex. This pump was powered by a 220 volt line running from a utility room inside the facility to the pump itself. The pump cycled automatically by a pressure sensing switch located in the utility room to maintain between 35 and 45 psi on the water lines at the facility.

On the day of the incident a water leak was observed in the area of the well casing. The victim and his supervisor attempted to locate the source of the leak in order to repair it. The area surrounding the pump casing was excavated to a depth of 18 inches using a backhoe. The two employees then proceeded to dig around the well casing with shovels. They dug to a depth of approximately 28 inches, but were unable to locate the source of the leak because the pump was not running and the water line was not pressurized. As they were standing in water in the excavation, the pump cycled on automatically. The supervisor received an electrical shock and heard the victim yell. The supervisor noticed the victim slumped over the well casing and ran to the garage to open the circuit breaker for the pump. Co-workers were immediately called to the scene and CPR was begun. A county ambulance was called to the scene and arrived approximately 25 minutes following the incident. The victim was transported to the local hospital where he was pronounced dead on arrival by the attending physician.

Investigation into the incident revealed that the pump was installed by a sub-contractor. The power for the pump was provided by three wires of approximately eight gauge which were buried and ran under ground to a one foot section of 3/4 inch plastic pipe which led the wires up through the metal protective cap and down the well to the submersible pump. No shielding or conduit was provided for these wires. Upon examination of the wires it was found that where the wires passed under the metal cap a "hot" lead was crushed. The damaged insulation on the lead apparently allowed contact between this conductor and the metal cap. This would energize the metal cap when the pump was running. It is assumed that the pump cycled on, the victim contacted the energized metal cap, and current flowed from the metal cap through the victim, who provided a path to ground.

Cause of Death:

The medical examiner ruled electrocution to be the cause of death.

Recommendations/Discussion

Recommendation #1: Employers should implement a hazard recognition program designed to enhance employee awareness of potentially hazardous situations.

Discussion: No safety training program was in existence with the employer at the time of this incident. Although the employees were working around a piece of electrical equipment in the presence of water, no thought appears to have been given to the possibility of any hazard being present. Employee awareness of the potential danger of working in wet locations near electrical equipment might have prevented this incident.

Recommendation #2: Electrical equipment should be de-energized whenever possible during maintenance/repair work.

Discussion: A work plan which minimized exposure to electrical hazards could have been developed. For example:

- (1) de-energize the pump with the circuit breaker located in the electrical panel and perform lockout/tagout procedures;
- (2) excavate around the well casing;
- (3) with workers well clear of potential electrical hazards, energize the pump to develop water pressure in the lines and locate the leak;
- (4) de-energize the pump and perform lockout/tagout procedures (again) prior to repairing the leak.

Recommendation #3: Employers should comply with existing articles of the National Electrical Code that apply to branch circuit underground wiring.

Discussion: Article 339-2 of the National Electrical Code requires that Type UF cable, which has more durable insulation, be used for underground branch circuit wiring. It should be noted, however, that this insulation protects the conductor, not the worker. To increase the safety of workers in wet locations metal sheathed cable could be used. Conductors in metal-

sheathed cable are enclosed in a continuous copper sheath and then encased in highly compressed insulation. If a fault occurs in a conductor the copper sheath will carry sufficient ground fault current to open the circuit breaker.

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